TOWN OF SEABROOK, NEW HAMPSHIRE
Sewer Department, Industrial Pretreatment Program

SUBJECT: **Managing Dental Waste**

Purpose

Dental offices across New Hampshire create a wide variety of waste during the course of a normal business day. These dental wastes need to be properly managed to avoid negative environmental impacts. This is easy to achieve following the guidelines below.

Which dental wastes are of environmental concern?

- Amalgam wastes including contact and non-contact scrap amalgam from capsule mixing, chair-side traps and vacuum pump filters, and amalgam sludge from separators
- Elemental mercury
- Used X-ray fixer
- Unused x-ray developer
- Lead foil from x-ray film
- Worn out lead aprons
- Lead lined boxes
- Cleaning and disinfecting solutions

Mercury and Mercury Waste

How harmful is mercury and mercury waste?

Mercury is a highly toxic, persistent and bio-accumulative neurotoxin. Once released, mercury will remain in the environment for years, dispersing over a wide area and accumulating in the tissues of plants, insects, and animals, concentrating in creatures higher up the food chain (e.g., humans). Health effects of mercury can be severe, particularly to a fetus in utero and to younger children.

What are the major sources of mercury waste in a dental office?

- Amalgam wastes, including contact and non-contact scrap amalgam from capsule mixing, chair-side traps and vacuum pump filters, and amalgam sludge from separators
- Elemental mercury

Where else are mercury and mercury wastes found in a dental office?

- Medical equipment such as thermometers and blood pressure reading devices
- Certain thermostats also contain mercury switches
- Fluorescent bulbs, and some high-intensity lamps

- Electrical equipment with switches, relays or temperature controls (thermostats)

There are non-mercury alternatives available for medical equipment and thermostats, and also bulbs and lamps available that contain lower amounts of mercury. Dentists should utilize these choices when starting an office or replacing items.

Why should I install an amalgam separator?

The Town of Seabrook requires that all dental offices that use or remove amalgam install amalgam separators. Tests indicate that dental wastewater contains as much as 100-2,000 parts per million (ppm) of mercury which greatly exceeds the state regulatory hazardous waste limit of 0.2 ppm and the Town's wastewater screening level of 0.006 ppm. Wastewater containing more than the legal limit of mercury must not be disposed to the sewer. Amalgam separators are used to capture the fine amalgam particles and dissolved mercury in wastewater that is not removed by chair-side traps. They can remove up to 99% of the mercury in dental wastewater.

What is an amalgam separator and what is it's purpose?

An amalgam separator is designed to remove waste amalgam from the rinse water in the vacuum line before discharge to sewer. These separator systems are used to capture scrap amalgam which is too fine to be removed by a trap or a screen. There are a number of separator manufacturers that offer a variety of models. Which separator to use depends on the amount of water discharged or the number of dental chairs operated at the dentist's office. These systems are usually installed by the suppliers and maintenance agreements are common. Amalgam separators can remove up to 99 % of the mercury from the wastewater before it is discharged from the dental office. Many of the available separators have been subjected to rigorous testing and have met ISO 11143 standards. Be sure to confirm that the amalgam separator meets these ISO 11143 standards at the time of installation.

What are ISO standards and what does ISO 11143 Standard Mean?

ISO standards are developed by the International Standards Organization. The ISO is a worldwide federation of national standards bodies. The work of preparing International Standards is normally carried out through ISO technical committees. There are ISO standards developed specifically for dental amalgam separators. These standards are designed to ensure that the separator removes at least 95% of waste mercury from the dental wastewater before discharge to sewer.

The official ISO 11143 standard for amalgam separators was published on 12/1/99. Be sure that the separator you purchase was tested using the official ISO 11143 standards in place after 12/1/99. Your separator manufacturer should provide you with a copy of the one-page test report annex upon request. Don't be fooled, some may claim that their amalgam separator is compliant with this standard and may not actually be ISO 11143 certified. Others may claim that

they had their amalgam separator ISO 11143 tested before December 1, 1999. This poses a problem because their separator was only tested against the draft ISO 11143 standard and there are significant changes between the draft and the official standard.

How do I choose the right separator for my office?

Amalgam separators are increasingly being used and required in many areas of the United States. Choosing the right separator for your office depends upon a number of factors, including: number of operatories, compatibility with your vacuum system, ease of operation, maintenance and replacement frequency, and whether or not waste disposal is included in the contract with the vendor. Cost is also a prime consideration and may range from $300 to over $2000, depending on whether installation and maintenance are included and whether the equipment is leased or owned, and if waste disposal fees are included. Be prepared to shop around for the machine that works best for you. These separators vary widely in sophistication and effectiveness. The following criteria should help you select the right system:

- The system should be effective, meaning that the company should be able to prove that it can remove the amalgam from the wastewater, regardless of particle size.
- There should be no compromise in suction power.
- You may want to consider a unit that is hands-off, meaning that the dentist or staff does not have to perform a series of manual operations, or be required to handle and change filters.
- The captured amalgam must be recycled. Make sure that the company which sold you the unit also arranges for the recycling of the captured amalgam. The company needs to provide you with the appropriate information on how to recycle the captured amalgam.
- Simplicity of design is a plus. There will be fewer chances for something to go wrong.
- The unit should operate quietly.
- The unit should come with a fail-safe mechanism that protects you from a spill or back-up in the event that a blockage occurs.
- The unit should install centrally so that the whole dental wastewater stream passes through it before discharging into the sewer system.
- The unit should be reasonably priced. Obtain information from the companies on the total cost for all services, including cost of the unit over a 5-10 year period, before making a decision.

For more information in choosing a separator please see the following articles from the JADA.

Laboratory evaluation of amalgam separators (American Dental Association, May 2002)

Purchasing, installing, and operating dental amalgam separators (American Dental Association, August 2003)

What about the amalgam sludge waste from the separator?

The most important consideration is whether your separator vendor will be handling this waste as part of your contract or whether you will be responsible for this waste yourself. If your dental office will be managing this waste stream yourselves, you should follow these practices:

- Amalgam sludge (and carbon filters, if any) from separators must be properly disposed of through recyclers or as hazardous waste.

- Maintain all disposal records on site for at least 3 years

- DO NOT PUT IN BIOHAZARD BAG. Medical waste is usually heat treated, which allows mercury to contaminate air and water.

If your separator vendor is managing the amalgam separator sludge, your office is ultimately still responsible for the fate of this waste, since you are the generator. Therefore it is important to ensure your vendor is properly disposing of this sludge as a hazardous waste and that you receive copies of their disposal records.

How do I handle wastes from chair-side traps?

Chair-side traps are either disposable or reusable. Disposable amalgam traps are preferable to reusable traps because it is difficult to effectively remove amalgam particles from the reusable trap without spilling them into the drain or garbage. Consider replacing size 40 mesh traps with size 100 mesh traps if your suction system can function adequately with the smaller mesh. These finer screens may be more effective at trapping amalgam particles; however, they may require cleaning and changing more often. Change or clean chair-side traps as often as necessary per the manufacturers directions. Use universal precautions when handling the chair-side trap.

Reusable chair-side traps:

- Flush the vacuum system with disinfectant before changing the trap. Allow trap contents to dry.
- Open the chair-side dental unit to expose the amalgam trap. Allow contents to dry.
- Remove non-amalgam fragments such as cement from the trap with cotton forceps and discard in the garbage. Remove all visible amalgam by tapping the contents into the container labeled CONTACT AMALGAM. Close the cover tightly. Dispose of through recycling or as hazardous waste.
- If the trap is visually clean, it can be reused (until worn out). Visually clean traps have been determined to be non-hazardous. However, a contaminated trap should always be recycled. Store contaminated traps in the contact amalgam container for recycling or disposal as hazardous waste.
- Do not put the amalgam trap or its contents into the sharps container, red biohazard bag, the trash or rinse it's contents down the drain unless an amalgam separator is installed.

Disposable chair-side amalgam traps:

- Remove the amalgam trap and place it directly into the contact amalgam recycling container. You will need to have a contact amalgam container that is large enough to accommodate the disposable chair-side traps.
- Do not clean disposable traps under running water or discharge the trapped amalgam into the wastewater system.
- Do not put the amalgam trap or its contents into the sharps container, red biohazard bag, the trash or rinse it's contents down the drain (unless an amalgam separator is installed).

How do I properly manage amalgam from vacuum pump filters?

- Replace vacuum pump filters regularly as recommended by the equipment manufacturer. Use universal precautions when handling the filters.
- Remove the filter. While holding it over a tray or other container that can catch spills, decant as much liquid as possible without losing visible amalgam. The decanted, amalgam-free, liquid can be rinsed down the drain.
- Put the lid on the filter and place it in the box in which it was originally shipped. When the box is full, the filters must be recycled. Be sure to check with your amalgam recycler to ensure that they will take these filters.

How do I recycle contact and non-contact amalgam?

Salvage and store all contact and non-contact scrap amalgam in separate, appropriately labeled, tightly closed containers. Recycle scrap amalgam through an amalgam recycler or hazardous waste hauler. Follow the requirements of your amalgam recycler for the storage, disinfection and shipping of scrap amalgam.

- If contact amalgam must be disinfected before shipment to your recycler, do not use any method that utilizes heat. The heat will cause the mercury to volatilize and be released into the environment.
- If you store scrap amalgam under used radiographic fixer, water, or other liquid. Do not decant the liquid down the drain under any circumstance. Contact your dental amalgam recycler or hazardous waste hauler for more information on how to dispose of this material properly.

What should I NOT do with scrap amalgam?

When removing an existing amalgam, remove it in chunks so that it is more likely to be caught in the chair-side trap.

- Never put scrap amalgam in the sharps container.
- Never put scrap amalgam where it will end up in the red biohazard bag.
- Never discard scrap amalgam in the trash.
- Never rinse scrap amalgam down the drain.
- Never remove excess amalgam from the amalgam well with the high-speed suction (the vacuum line).

- Never place extracted teeth with amalgam restorations in the red biohazard bag. They should be placed in the CONTACT AMALGAM container. Use universal precautions when handling extracted teeth (glasses, gloves and mask).

How should I dispose of waste amalgam capsules?

After mixing, amalgam capsules may still contain small amounts of mercury. All capsule waste, including any defective capsules, should be placed in a marked container with other non-contact scrap amalgam and then be recycled. Be sure to check with your amalgam recycler to see if they will take capsules with your scrap amalgam.

Do not dispose of amalgam capsules in the garbage, the red biohazard bag or through incineration. The capsules are hazardous waste and must be properly recycled or disposed through a hazardous waste hauler. Some companies may take amalgam waste shipped via mail-away containers.

How should I manage elemental mercury?

In the event that elemental mercury is present in your dental office:

- Recycle all elemental mercury. Many hazardous waste haulers and dental amalgam recyclers will accept elemental mercury for recycling.
- Never rinse elemental mercury down the drain.
- Never dispose of elemental mercury in the trash.
- Never dispose of elemental mercury in the sharps container, or as medical waste.
- If there is only a small amount of elemental mercury is to be recycled, it may be possible to initiate a reaction with amalgam alloy to form scrap amalgam, which must then be recycled through your amalgam recycler.

What questions should dentists ask their amalgam waste service providers?

- What is your area of service?
- Do you provide “regularly scheduled pickup services” or is this on an “as needed basis”?
- What kinds of amalgam waste do you accept? Wet? Dry?
- Do you provide packaging for storage, pick-up or shipping of the amalgam waste?
- How do you want the amalgam waste packaged (if you do not provide packaging)?
- What kinds of amalgam waste can be packaged together?
- Do you accept whole filters from the chair side trap and from the vacuum pump for recycling?
- Is disinfection required for amalgam waste?
- Do you accept extracted teeth with amalgam restorations?

Should I consider replacing mercury contaminated plumbing?

After your office adopts its new mercury and amalgam management practices, it may be a good time to clean or replace sink traps. Mercury from past practices often settles at low points such as sink traps and sumps. The slow dissolution of the mercury in a sink trap or sump can release mercury into the wastewater for years after past disposal practices have been corrected.

Whenever plumbing parts are removed or cleaned, caution should be taken to avoid spilling the contents in case amalgam or mercury are present. Pour and brush out the sludge and handle it as you would handle contact amalgam. The plumbing parts can then be put back in place or recycled.

What should I do in the case of a mercury spill?

Mercury spill kits are available from a number of sources, including companies that specialize in Occupational Safety and Health Administration (OSHA) compliance supplies and equipment; amalgam recyclers; and dental product suppliers. Before purchasing a kit, make sure it comes with complete instructions on how to perform a spill clean-up. Train several staff members in proper spill clean-up procedures.

The following steps should be followed in the event of a mercury spill:

- Put on disposable nitrile gloves and clean it up immediately. (Do not use latex gloves as mercury can penetrate latex).
- Clean up all visible elemental mercury using a mercury spill kit.
- Never suck up spilled mercury with a vacuum cleaner.
- Place all contaminated items (including materials used during the clean up procedure and broken pieces of glass) in a sealable plastic bag or container. Label the bag or container as Mercury Waste.
- Dispose of all contaminated materials through a hazardous waste hauler. Never dispose of contaminated waste in the sharps container, biohazard bag, or trash.
- Consider replacing mercury-containing equipment with non-mercury containing alternatives. Non-mercury containing products are available at cost-competitive prices.
- If you are concerned about the possible uncontained presence of mercury in your dental office due to historical or recent mercury spills, equipment is available for the detection of mercury vapor in the workplace environment and for the location of mercury spills. This equipment can be rented from rental test equipment companies.

What concerns are there with office renovations and mercury spills?

Alert renovators to the possibility of historical mercury spills that may have resulted in the presence of mercury in carpets, floor cracks, behind moldings and other areas where elemental mercury may have been used, or where amalgam capsules may have been spilled.

Best Management Practices for X-ray wastes

What should I do with used fixer?

Used fixer from X-ray processing is defined as a hazardous waste because it contains high concentrations of silver – 3,000 to 8,000 parts per million (anything over 5 ppm is hazardous waste; the Town's wastewater screening level for silver is 0.047 ppm). Because of these high silver levels, it's ***illegal to put used fixer down the drain, into a septic system or into the garbage.***

- Collect used fixer in a container marked "Used fixer only". Keep fixer separate from your developer.
- Have a hazardous waste management service pick it up for recycling or hazardous waste disposal.
- Ask your supplier to take it back. Some will take it at no cost and reclaim the silver. Keep disposal receipts.
- Buy a recovery system to reclaim the silver yourself. This option is not highly recommended as it most likely will not be cost-effective and may not function properly at all times due to maintenance requirements. To be effective and meet silver discharge limits, such systems need to have two canisters placed in a series as well as regular canister replacement, maintenance and testing. Most dentists generate less than one gallon of fixer a month and find it more cost effective and convenient to collect used fixer for proper recycling or disposal.
- To avoid generating waste fixer at all, consider switching to digital imaging.

Which is more cost-effective, on-site or off-site treatment of used fixer?

Using silver recovery units for the management of used fixer only makes economic and practical sense if the flow of used fixer is at least 2-3 gallons per week. Most dental offices generate a gallon or less of used fixer per month; not enough flow to make on site silver recovery cost-effective, due to the cost of buying and periodic replacement of two such units (two are required). Such minimal flow also allows the steel wool in the recovery units to rust between uses, making the units ineffective in as little as 6 months after first use.

What should I do with used developer?

UNUSED developer contains hydroquinone which is a toxic substance, so unused developer cannot go down the drain. Because hydroquinone is used up in the developing process, **USED developer** is non-hazardous and is safe to be disposed to the sewer.

- **Keep developer and used fixer separated.** Fixer cannot go down the drain and developer will ruin silver recovery systems. Most x-ray developing machines have separate hoses or trays for these wastes, making it easy to keep them separate.
- If used fixer and developer accidentally get mixed together, the mixture must be disposed of as hazardous waste.
- Flush the drain thoroughly as you dispose of the used developer.

- Do not dispose of developer, whether used or unused, to septic systems as it may cause them to fail.

How should I handle used x-ray film?

Used x-ray film contains silver and is hazardous waste. Collect it for recycling or proper disposal.

What should I do with lead foil?

Lead is a hazardous waste and should not be put in the garbage, nor in with biohazard bag biomedical waste or sharps.

- Collect lead foil from x-ray packets for recycling.
- Many dentists melt down their collected lead foils to make fishing weights. This is not illegal but is not a recommended BMP. Dental offices should not give lead foil to patients.

Are lead lined boxes a concern?

Yes! Dentists who use certain old-fashioned dental boxes to store X-ray film may be unwittingly exposing themselves and patients to dangerous levels of lead, according to an Associated Press story. Dental inspectors in Washington and Wisconsin stumbled onto the bizarre risk after noticing that X-ray film stored in certain boxes had a dusting of white powder.

Laboratory analysis found that the powder was almost 80% lead. Wiping off the powder didn't get rid of the lead, says Food and Drug Administration (FDA) engineer Dave Daly. To keep X-ray film fresh before placing it into patients' mouths, dentists usually store it either a safe distance from X-ray machines or in lead-lined radiation-proof containers specially treated to keep lead from leaching. That's important because lead poisoning can cause serious neurological damage, particularly in children.

But it turns out that some dentists use old-fashioned boxes--often made of wood, shoebox-sized--with an untreated lead lining to store X-ray film. Washington and Wisconsin alerted the FDA that hundreds of such boxes may be in use, Daly says. One dentist told a state inspector that he used his for nostalgic reasons: his dentist father had passed it down.

The FDA issued a nationwide alert telling dentists to throw away X-ray film stored in such boxes. While no illnesses have been reported, "in may cases there are highly dangerous levels of lead on the films, enough to potentially cause serious adverse health effects in patients and health care professionals," the alert warns.

The FDA cautions that the boxes need to be disposed according to each state's safe-lead regulations. The boxes cannot be converted for other use.

How should I handle worn out lead aprons?

When aprons are no longer usable, they must be disposed of as hazardous waste due to their lead content. Keep them out of the landfill and the biohazard bag.

- Ask your supplier or the original manufacturer if they will take them for recycling or proper disposal.
- Dispose of worn out aprons as hazardous waste.

Best Management Practices for disinfecting/cleaning solutions

How should waste disinfecting solutions be handled?

Disinfectants, cleaning solutions, chemiclave solutions and cold sterilants may designate as hazardous waste depending on their ingredients and concentrations.

- Solutions of concern include: sterilants with gluteraldehyde, Vaposterile, formaldehydes, phenols, ammonia, acetone, bleaches, x-ray developer and cleaning solutions containing chromium.
- Use up the product, don't pour it down the drain to get rid of extra product.
- If you have unused or expired product to dispose of, collect it for disposal by your hazardous waste management service provider.
- The Town of Seabrook recommends (encourages) conversion from chemiclaves to autoclaves, especially as old equipment needs replacement.

What are safe cleansers for flushing the vacuum system?

Flush the vacuum system with disinfecting line solution before changing the chair-side trap. Note: Recent research has suggested that some types of line cleansers, such as those that contain bleach, may solubilize mercury from amalgam particles. This would increase the release of mercury into the dental wastewater. According to the Naval Dental Research Institute, the following line cleansers do not appear to dissolve mercury from amalgam and are alternative disinfectants to bleach:

- E-Vac
- MAXI-EVAC
- Super Dent
- Evacuation Cleaner ProE-Vac
- Turbo Vac Line Flush
- EZ-Zyme
- Purevac
- Vacu Cleanse
- Gobble Plus
- Sani-Treat Plus
- VAC-U-EZ
- Green and Clean
- Stay-Clean

The best method is to flush the line with an appropriate line cleanser at the end of the day, and then change the trap the next morning before the suction is used. This method will allow the particles in the trap to dry.

An alternative method is to flush the system with a cleaning solution according to the product's directions; then remove the lid from the trap and allow air to pass through the trap until the contents are dry (usually not more than five minutes).

This document is based on information originally developed by the State of Washington, Department of Ecology whose contribution is gratefully acknowledged.