

**Guidance on mercury releases to land and water under article 9 of the Minamata Convention on Mercury
Compilation of comments and responses**

Comments received from:

- Argentina
- EU and its member states
- Jamaica
- Japan
- Nigeria
- Thailand
- US
- Association of Lighting and Mercury Recyclers (ALMR)
- International Council on Mining and Metals (ICMM)
- International Dental Manufacturers Association (IDM)
- IPEN
- Alfa Laval Technologies AB
- Atium
- OASIS

The following table presents the comments received, with “response” column explaining how these comments were taken into account. Since this table has been developed through multiple revisions of the document, the “responses” may not reflect the final text of the document.

General comments

Submitter	Comment	Response
Argentina	Chapter 3. It would be clarifying to introduce this chapter on control releases describing mercury speciation (as described in line 350), and refer to the concern regarding methylation and bioaccumulation of mercury that occurs in the aquatic environment; which is avoidable if inorganic mercury is not released in the first place.	Section 1.3 was added based on a similar section in Article 8 BAT/BEP guidance.
Argentina	Chapter 3. Techniques could be introduced making an analysis considering best efficiencies were found combining them. As they often consist on a pretreatment (removal of uncontaminated solid particles), treatment (reduction/oxidation in order to obtain mercury specie susceptible to treatment, precipitation, etc) and physical removal (filtration, coalescence, adsorption, etc.); techniques could be regrouped in those categories.	“Best efficiencies” are not easily determined. The grouping and ordering of the techniques largely follows the order of application of techniques to wastewater/releases.
Argentina	Chapter 3.3 Ion exchange: Analysis on utility and situations in which this technology is convenient are missing. This method has advantages such as the possibility of performing a pre-concentration of mercury for low concentration samples, in order to reduce concentrations of releases to even lower limits; and may prove to be applicable as a rapid screening method for mercury speciation in environmental samples (potential for monitoring’s source in the last comment section). In addition, a comment on negative	Added to section 3.3.

	aspects could be included, as mentioned before, regarding useful life and resin replacement.	
Argentina	Chapter 3.4 Adsorption on activated carbon: Desorption process is missing.	Text was added to regeneration and treatment of spent activated carbon.
Argentina	3.5 Biological treatment: Sludge disposition or post treatment as well. General comments addressing the need for a post treatment or disposal that may involve capacity building should be taken into account in order to make an informed decision when choosing a technique.	Text was added on the disposal of sludge from biological treatment.
Argentina	APPENDIX: Emerging and innovative techniques. Aminopyrrolidine dithiocarbamic acid (APDC) or diphenylthiocarbazon (dithizon) coprecipitation of the trace metal with a thiol-containing organic complexing agent seem promising. Specificity for the removal of heavy metals as an alternative to sulfide, interesting when there are ambient chelators in industrial effluents.	The addition of chelating resins as proposed by Japan will accommodate this comment.
EU	<p>The adding of a prefixed subchapter “<i>Chemical forms of mercury in water and land</i>” in Chapter I ‘<i>Introduction</i>’ would be helpful for the reader’s understanding and to prevent unnecessary duplications in further chapters of the Guidance.</p> <p>This will mirror what has been done regarding the Guidance on best available techniques and best environmental practices taking into account any difference between new and existing sources and the need to minimize cross-media effects, adopted at COP1 (UNEP/MC/COP.1/7), in accordance with Article 8, paragraph 8, of the Minamata Convention (see section 1.3 ‘<i>Chemical forms of mercury</i>’)</p>	A separated chapter was added. See added section 1.3
Japan	<p>Japan found that the information on chelating resins that are widely used for mercury removal from wastewater is insufficient in both documents. We propose to include following information as 3.4 Bis in the Draft guidance on the BAT/BEP and/or in “3. Adsorption” in the Technical Reference Document.</p> <hr/> <p><u>General description</u></p> <p>Chelating resins are resins with functional groups that form chelates (complexes) with metal ions, and they capture metal ions by forming chelates with specific metals. They are used to remove toxic heavy metals such as mercury, copper, zinc and cadmium, as well as to recover precious and valuable metals such as gold, platinum and palladium.</p> <p>Selective adsorption and removal of mercury is generally performed by resins with sulfur-containing chelate-forming groups such as thiol group (-SH), thiourea group (-NH · CS · NH₂), thiocarbamic acid group and dithizone group. After filtering and separating suspended matter and insoluble mercury compound particles in wastewater, a small amount (about 5 mg/L) of chlorine is added under acidic conditions (pH 2~6) to completely ionize mercury, and make the liquid pass through a reaction tower filled with chelating resin to adsorb and remove mercury. Since the sulfur functional group of the mercury chelating resin is sensitive to chlorine, the amount of chlorine added should be limited to 5 mg/L.</p>	Added.

Chelating resins can last longer but are difficult and expensive to regenerate. Therefore, it is desirable to remove most of the mercury by the sulfide method in advance when the mercury concentration is high.

Exchange group	Adsorbed ion	Feature
Thiol system	Hg ²⁺	<ul style="list-style-type: none"> ▪ Mercury can be selectively removed. ▪ Sensitive to oxidants since the chelate-forming group contains sulfur.
Thiourea system	Hg ²⁺ 、Cd ²⁺ 、Pb ²⁺ 、Zn ²⁺ 、Cu ²⁺	

Cross-media effects

Precious metals (gold, platinum, palladium) can be adsorbed in addition to mercury.

Applicability

The chelating resin adsorbs only mercury ions dissolved in water. Therefore, those that are not in the ionic form, e.g., metallic mercury form, need to be ionized by adding an oxidizing agent and dissolved in water to adsorb by chelating resins.

Factors affecting adsorption performance

- The chelating resins cannot be used for oxidizing solutions since oxidizing substances will disintegrate the resin itself.
- Generally, chelating adsorption towers are installed in the last step of the process. Since wastewater is contaminated with all kinds of substances, they are removed in pretreatment and mercury is adsorbed last. When mercury concentration is high, it is desirable to remove most of the mercury in advance by sulfide method, etc.

Reference

1) Editorial committee on pollution prevention technology and regulations. (2022). *New Pollution Prevention Technology and Regulations in 2022 (Water Quality Edition)*. Japan Environmental Management Association for Industry. ISBN978-4-86240-196-0 (in Japanese)

Misorogi, N. (2015). *Theories on Hazardous Substances in Water (Revised Edition)*. Japan Environmental Management Association for Industry. ISBN978-4-86240-131-1 (in Japanese)

Thailand

According to Chapter 4 item 4.3 Oil and Gas, each party should be having individual authority to determine the BAT mercury limitation for residues from oil and gas

Thank you for this information. No change in text is needed.

	<p>exploration and production (offshore drilling fluids and drill cuttings etc) based on their background data and risk assessments. (The comment further provided the regulatory requirement in Thailand)</p>	
Atium	<p>We are a university spinoff startup developing a research-based electrochemical technology for selective removal of mercury from industrial wastewater and from acids. While not able to compete for BAT-status yet, we have seen significant competitive advantages compared to conventional solutions. These are mainly a high removal efficiency (reaching below the ppb-range), very low waste generation, corrosion resistance and selectivity towards mercury ions. During 2023 and 2024 we will be scaling up and piloting with industrial users, to demonstrate the benefits. As I wrote, we are not a commercially available solution yet, but will be in 2-3 years. If there is any room in the report relating to the future outlook, current R&D-projects or similarly, we would love to contribute. Please reference our website www.atium.se or contact me, as well as the research of Dr. Björn Wickman at Chalmers University of Technology in Göteborg, Sweden.</p>	Thank you for this information. Specific companies will not be mentioned in the document.
Alfa Laval Technologies (PW)	<p>The draft has taken good amount of information on technologies that can be used for mercury removal for waste treatment. However, the coverage on technologies and process description are limited to merely downstream treatment of mercury contaminated wastewater. It is strongly recommended to include more information on upstream treatment of mercury removal from sources, especially from hydrocarbons in oil and gas industries. Substantial efforts have been paid by companies in this industrial sector, including Shell, Chevron, Schlumberger, and Alfa Laval, over the past few decades in developing sustainable technique to reduce mercury emission to the environment. It has been suggested by industrial process engineers and technologists to adopt self-cleaning filtration technique, either as self-cleaning membrane filtration unit (den Boestert et al., 2021) or self-cleaning centrifugal separator (Manelius & Aguedach 2018), to be used as pre-treatment facility in highly contaminated waste flow before sending effluent to downstream polishing for mercury removal. Using finer adsorption material (powder), for example, granulate in the size range 5-10 µm, can be effective with a filter/separator system. This use of finer granule structure can significantly increase adsorption surface area compares to fluid adsorption beds or adsorption pellets. In addition, by dosing the fine adsorption material in combination with continuous filtration (frequent removal of the filter cake), the system is less prone to adsorbent fouling effects. Continuous separation equipment like Alfa Laval disc stack centrifuges with self-ejecting (discharge) solid removal function, are ideal to be used for removal of condensates at micron level. Such technology of using Alfa Laval PX separators has been successfully applied to mercury removal from crude oil streams (Manelius & Aguedach 2018). Self-cleaning filtration for mercury during decontamination where mercury is present in solids (mercury sulphide) has been applied at the Den Helder gas and condensate receiving plant in the Netherlands (den Boestert et al., 2008). On a general level, the document misses out to recognize centrifugal separation as one method to remove mercury contaminants from crude oil streams. This has been used previously in Oil & Gas and still in use with excellent results. The comments proposed in this review address this in the relevant sections of the document.</p>	Centrifugal separation was added in section 3.1. Further information will be considered for the future addition to the technical reference document.

<p>ALMR</p>	<p>Of all the sources of mercury discussed in the draft guidance document, throughout the reference materials, as well as Article 11 paragraph 2, mercury lighting is not specifically called out. We have had numerous discussions about recycling mercury lighting at the COP meetings, the intercessional meetings and the GMP Waste Management Webex zoom conferences, yet there is no guidance to specifically inform countries that the only fail-safe method to prevent uncontrolled mercury releases from lighting is to prevent uncontrolled handling. It is guaranteed that uncontrolled handling causes breakage, releasing mercury.</p> <p>Lighting is the most ubiquitous source of mercury that is released into the environment. While lighting contains less mercury per unit than many other sources, the fact that lighting is used by most humans on earth means that releases from 10s of billions of mercury lights occurs annually directly into air, water and on the land. And these releases occur in billions of locations. The chemical and biological fate of this mercury is well understood.</p> <p>Many developed countries have established end-of-life management systems for mercury lighting, including collection and safe processing to prevent mercury releases. Most developing countries and SIDS do not have this. Moreover, even in developed countries with infrastructure, policy exemptions and low enforcement contribute to low recycling rates. Some of the GMP partners have described lighting recovery systems, mercury removal techniques and reuse of the materials that comprise lighting. This information has been provided to the GMP in the WMA Catalogue, Source and reference materials and Success Stories. We suggest that references to these materials, or excerpts from these materials be included in the Guidance documents here.</p> <p>In all countries there are low risk methods to minimize or prevent uncontrolled breakage leading to mercury releases. Where population is high there are government and private collection events followed by legal recycling. Where population is lower, or where capital investment can't be supported, there are low-cost collection programs and pre-treatment options that lead to the lighting being sent to other countries for complete recycling.</p> <p>There is an established industry, with members including both Parties and Stakeholders of the Convention, that can set up or assist with any program to divert mercury lighting from uncontrolled breakage. We believe that this approach is under-utilized due to intense pressure to prioritize the sale of lighting where no end-of-life management exists. More recently, pressure to sell LED lighting to replace mercury lighting, combined with regulatory/statutory policies to ban mercury lighting are upstaging the platform to recycle. To the degree that this disparity exists we can expect many years or decades of uncontrolled releases.</p> <p>Unlike many of the sources of mercury releases that come from corporate or institutional activities, lighting is used by individuals, households, small businesses, and consumers in general. Empowering people everywhere to divert lighting from the trash helps each person take personal responsibility. We think this is hugely rewarding and will also help people embrace the other elements of the Guidance.</p>	<p>This guidance addresses relevant sources under Article 9. Consideration for lamp recycling is addressed in technical guidelines on the environmentally sound management of mercury waste.</p>
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ICMM	<p>Experts in industrial wastewater treatment from ICMM member companies are concerned over the provision of ranges of achievable concentrations in the draft Guidance document without more information on the design basis, aqueous matrix, unit operations and reagents utilized, operating conditions (especially pH), equipment utilized, residuals management, etc that give rise to those values. Such an approach is not appropriate or helpful in informing users of the guidance on BAT/BEP measures to be taken. Experts are also concerned that the suite of technologies included in the document is not comprehensive as several control applicable technologies are not described; the control technologies included seem to be focused on those used in the chloralkali sector. We have briefly reviewed the information provided in the technical Annex and find that it does not describe the full range of conditions that can exist. Consequently, the technical Annex neither justifies the cited performance levels, nor justifies their generic read-across to all scenarios.</p> <p>To ensure that the BAT/BEP Guidance remains generically applicable, it is recommended to avoid accidentally misleading users of the guidance by speculating about general relevance of concentrations achieved in an incomplete set of circumstances.</p>	<p>This guidance follows the approach taken in Article 8 BAT/BEP guidance (emissions) to mention achievable levels for information purpose, clearly stating that they are not mandatory levels that need to be achieved, and that actual levels will vary according to local circumstances. However, through a review of the technical reference, many of the texts on achievable levels were indeed limited to specific circumstances, so those were removed in the new draft.</p>
ICMM	<p>Generally, many of the techniques described in Section 4 are applicable across several different potential sources – so not really “for specific sources”. This raises the question of whether it is advisable to keep Chapter 4, or whether all gathered information should instead be presented in Chapter 3.</p>	<p>The intention was to provide an overview of the general techniques and a description for some relevant sectors. In some cases, the techniques are duplicated, as they are applicable for several sectors.</p>
IDM	<p>BAT/BAP for dental amalgam Amalgam Separators that meet the ISO 11143 Dentistry – Amalgam Separator standard are currently the BAT for capture of amalgam waste. These separators are placed in line after the suction system, separating the water and solid particles that come from the patient’s mouth after either placement of dental amalgam or removal of old amalgams. This prevents amalgam waste discharge to waterways. The particles range in size from 1mm to 1 micron and have a very high mass to surface ratio.</p> <p>It is important to note that blood, tissue and saliva are also captured and when the amalgam container is full, the contents should be covered with a non-chlorine disinfectant to kill the bacteria and virus’s present.</p> <p>There are 4 classifications of Amalgam separators Type 1: centrifugal system Type 2: sedimentation system Type 3: filter system Type 4: any combination of types 1, 2 and 3</p>	<p>The Secretariat could not obtain advice from members and observers on specific techniques on the control of releases from dental amalgam. General techniques is described in Chapter 3, and specific information will be added to technical reference document.</p>

	<p>The filled catchment container must be collected/sent to an authorized recycler for recycling and the retrieved mercury be sequestered or used again for permitted purposes.</p> <p>BAP for dental amalgam is to collect the larger amalgam waste particles (contact waste amalgam) that are captured in the filter in the dental chair and store these in a suitable container, again covered with a non-chlorine disinfectant for recycling.</p> <p>Any teeth that are removed with amalgam still present should be placed in this container. Amalgam that has been mixed and not used on the patient (non-contact amalgam) should be placed in a separate container or in the same contact waste amalgam container for recycling.</p>	
IPEN	<p>The BAT BEP draft guidance is a good start but more detail is needed in some sections such as releases from chlor-alkali facilities and how to control/eliminate them. Similarly the pulp and paper section would benefit from more detail. Key issues are what sources within the industry sectors should be identified. If it is certain chemicals that are used e.g. slimicides in pulp mills – BAT BEP could require substitution of those chemicals for non-mercury alternatives rather than end of pipe filtrations systems that cannot fully eliminate releases.</p>	<p>The control of releases from Chlor Alkali is covered by Article 5, so this guidance will not include detailed information.</p> <p>While further information on pulp and paper would be appreciated, use of raw materials with less mercury was added as general technique in Chapter 3.</p>
OASIS	<p>The report should be focused to the significant sources of mercury compound emissions that can reach the air, soil and water. This primarily refers to anthropogenic sources of pollution such as mines (gold mining), coal mining, waste (nuclear waste, medical, battery disposal mine tailings, fluorescent lamps etc), mine tailings. The text included sources that sporadically emit mercury compounds in very low concentrations (ppb or ppm) or in some case even wrongly reports that some sources do contain mercury compounds (Oil and gas). It is also important to distinguish natural and anthropogenic sources of emission of Hg (to add not more than one paragraph).</p> <p>Mercury and its compounds can be found in nature, and its existence in nature cannot be eliminated such as volcano eruptions or ore deposits or in soil that is formed on the rock and minerals that contain mercury. With an average share of 0.083 ppm in the Earth's crust, mercury ranks 65th in terms of abundance among chemical elements in nature.</p> <p>However, cinnabarite (HgS) is an ore with high concentration of Hg. For instance, there is a HgS deposit, located in the vicinity of Belgrade (Avala mountain), which is no longer exploited, but for sure a certain hydro-geo-chemical environment can enable further dissemination of mercury compounds into the water and soil even though the exploitation is closed. In that respect, management of the closed mine and its tailings is very important for the mercury pollution control.</p>	<p>The submitted information will be used in the technical reference document as appropriate, noting that this guidance is about the control of mercury releases to land and water from relevant sources under article 9 of the Convention.</p>

Special attention has to be paid to the coal combustion in power plants that are significant sources of emission of mercury into the air. In particular a special attention has to be paid to air quality monitoring from the qualitative and quantitative point of view such as PM 2.5 and PM 10 that are associated with mercury emitted from coal mines.

Parties should to be therefore oriented towards the comprehensive monitoring of air, water and soil as well as the elimination of mercury compounds from the technological process and waste disposal, mine tailings, while not paying too much attention to the small concentrations of mercury from the natural source of emission (volcano, geological settings etc).

The report should include the explanation of the level of toxicity for humans of each mercury compound. The toxicity of mercury depends on its chemical form and the type of exposure. Compounds containing mercury in oxidation state +I are less toxic than compounds of mercury in oxidation state +II because they are less soluble (it is important to compare analogous compounds, for example HgCl_2 and Hg_2Cl_2). On the other side, organic mercury compounds (methyl mercury and dimethyl mercury) are more toxic than inorganic ones. Methylmercury can be primarily found in fish in the aquatic environment. Fish and fish products are the main source of methylmercury.

In terms of the best environmental practices, I would kindly suggest you to take into consideration natural products – minerals such as clays and zeolites that are in use for the prevention and protection of soil pollution with mercury under section 3.3 Ion-exchange .

Citation: Gordana Grujic, 2015, UNCCD 3rd Scientific Conference, Mexico: There are many cases of heavy metal dissemination occurred, and mostly it is demonstrated that the clay fractions exert a major control on pollution retention and mobilization. Clay minerals are essential constituent of soil at the interface of the major environmental mediums, between air and solid earth, surface water and groundwater, that occurred in most pathways of geological settings and in rocks itself and hence are important to the transfer of potential pollutants in different waste disposal, from very communal to mining ones. Based on their mineralogical peculiarities, clays can be used in barriers for waste disposal to prevent percolation in the geological-geochemical environment. Clays are characterized by a specific grain size and peculiar properties such as low permeability and excellent adsorption capabilities for cations molecules, due to its high rate of cation exchange capacity (CEC), depending on their mineral composition and structural layers disorder. The highest rate of CEC from 2.0 – 0.6 (meq/g) are specific to clay minerals including Vermiculite, Saponite and Montmorillonite, while the lowest rate of 0.02 – 0.5 (meq/g) show Kaolinite, Illite, Glauconite

On the other side, zeolites have the higher CEC than clays. The selectivity of the zeolites towards the cations examined differs in the order: $\text{Pb}^{+2} > \text{Cd}^{+2} > \text{Cs}^{+} > \text{Cu}^{+2} > \text{Co}^{+2} > \text{Cr}^{+3} > \text{Zn}^{+2} > \text{Ni}^{+2} > \text{Hg}^{+2}$. This depends on the fact that adsorption phenomena are

	influenced by charge density as well as by hydration energy and ionic radius of the cations.	
OASIS	<p>Additional clarification related to the chemical composition of the crude oil. There are scientific manuscripts related to the presence of mercury in crude oil, but in most cases the conc. of mercury is very small and probably the origin of mercury is sedimentary rocks around the crude oil deposit. Crude oil doesn't contain mercury compounds based on the literature I learned and data I have obtained in some projects. I have been working for the national oil company in particular on the organic geochemical research of crude oil, and I have never seen a result of the crude oil with mercury even in a trace conc..</p> <p>Of course, the composition of crude oil depends on the geological settings, so in that respect in some parts of the world maybe there are cases with small conc of mercury detected.</p> <p>I made my comments base on the research I have been involved.</p>	The BREFs contain indications about the existence of Hg in crude oil, based on documented evidence.

Specific comments

Submitter	Line	Comment	Response
OASIS	11	To add air: reducing releases of mercury and mercury compounds to air, land and water from relevant sources identified by the Party	The Art. 9 and Guidance refers to land and water only. Air is addressed in another Guidance - Guidance on best available Techniques and best environmental practices
IPEN	12	Is it premature to state this guidance has been adopted?	This will be presented as draft to COP, which is expected to adopt this guidance including this sentence.
ICMM	19	<p>We noted at the informal meeting of experts on 19/December 2022, that experts agreed to insert the following paragraph to clearly define 'relevant source':</p> <p><i>“A “relevant source” is any significant anthropogenic point source of release as identified by a party that is not addressed in other provisions of the Convention. Paragraph 3 of article 9 provides that each party identify the relevant point source categories.”</i></p>	This particular language is included in footnote, and also similar sentence is in chapter 1.5.
OASIS	22	To add air: Minamata Convention addresses mercury releases to air, land and water	The Art. 9 and Guidance refers to land and water only.
IPEN	24&25	Selected sources are included but others should be added including pulp and paper mills and alumina production residue from the Bayer process such as 'red mud'. Also residues from any industries using the acetylene (C ₂ H ₂) hydration process to produce acetaldehyde. Residues from this process contain considerable leachable mercury compounds.	Secretariat could not obtain technical information to add specifically on these sources.
Nigeria	26	'Sufficient Maturity' should be reworded for better understanding	Revised.
ALMR	45	The reference to Article 9 paragraphs 4 and 5 states that "A Party with relevant sources shall take measures...". All Parties do have and use lighting but do not "take measures to control...". This reference clearly includes	See response to general comments on lamp recycling.

		mercury lighting, yet subsequent text does not discuss controls for lighting waste.	
Jamaica	62	There were no source categories observed from the UNEP mercury inventory toolkit for 'coal mining' and 'reuse or recycling of used industrial equipment'. The column description at the top of the table implied that the sources were all referenced in the UNEP mercury inventory toolkit. If not so, there could be consideration of a note to the table to clarify the absence.	A footnote was added about that UNEP inventory toolkit does not have numbers for these sources.
Nigeria	Table 1: 5.1.3	The release sources should also include process residues , considering that refinery residues can be a source of contamination.	This table was agreed at COP-4.
Nigeria	Table 1: 5.8.1	The release sources should also include process residues.	This table was agreed at COP-4.
Nigeria	Table 1: 5.9.1	Should include 'land' i.e Releases to land and water from landfill leachate.	This table was agreed at COP-4.
Nigeria	Table 1: 5.10.1	The release sources should also include process residues .	This table was agreed at COP-4.
ALMR	62 Table 1.	It is not clear whether lighting is considered a relevant point source. Some would argue that it is not a point source in the traditional sense of point sources, and others would argue that billions of discarded mercury lights annually are billions of small point sources. Either way, we recommend that a reference to lighting be included in section 5.5.1-5.5.9 with Manufactured products with intentional use of mercury.	See response to general comments on lamp recycling.
IPEN	Table 1	More information required on the cement industry residues such as CKD and how they are managed, disposed or stockpiled. The recent webinar on Mercury Releases from the Cement industry Area Meeting (mercury partnership) should provide more detail that could be used.	As the Secretariat contacted Global Mercury Partnership – Cement Area, the Area Lead highlighted that cement-kiln dust (CKD) is in most cases either recycled in the cement itself or in the process or used as products in other applications, and that this is actually what should be considered as best practice to avoid any release.
IPEN	Table 1	5.3.2 more information required on the use of mercury based slimicides in process waters and their subsequent releases	Secretariat could not obtain technical information to add specifically on these sources.
IPEN	Table 1	5.3.4 Releases from mercury based pesticides should be included. In Australia the herbicide Shirtan (used on sugar cane) released 5000 kg Hg annually into waterways. Release is presumed to be ongoing despite deregistration of the product.	Pesticide is addressed in Article 4, and the expert group did not propose it as relevant point source.
IPEN	Table 1	There is no mention of releases from Hg contaminated sites or methods to control them in this table. Does the Minamata Contaminated sites guidance address releases directly? If not it should be addressed here.	Contaminated sites are not included in the list of potentially relevant point sources.
IPEN	Table 1	5.7.3? Numbering incomplete. The issue of mercury releases from shipbreaking is significant especially breaking FSOs, FPSOs, decommissioned pipeline infrastructure etc. where mercury is bonded via amalgamation to steel hulls and cut up or subject to 'flame cleaning' with	A footnote was added on the lack of numbering in UNEP Inventory Toolkit. This entry is about industrial equipment, and the expert group did not propose shipbreaking as relevant point source.

		blow torches on beaches releasing mercury to air, soil, sediment and ocean water. This should require detail in chapter 4.	
IPEN	Table 1	5.8.1 should this read 'releases from air pollution control system <i>residues</i> '?	There may be wastewater from air pollution control systems.
OASIS	Table 1	To add air: Releases to air, land and water from coal storage, coal washing and air-pollution-control systems.	Air is out of scope of the present Guidance.
ALMR	64 and throughout Chapter II and Chapter III	We recommend that these sections specifically include methods to avoid releases from lighting in the discussions of BEP and common techniques for control of releases.	See the response on lamp recycling in general comments.
Argentina	70 -71	Costs for application, equipment maintenance and capacity building of such technology.	Equipment maintenance and capacity building were part of application of technology.
Argentina	73	For general steps an example of each one would be useful. Maybe the example could be included at the end of chapter III once techniques are explained.	Examples will fit better to technical background document, which will keep updated with practical information.
ICMM	94-101	With reference to our general comment (above), we recommend that Section 2.2 and information about performance levels in Chapters 3 and 4 be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	See general comment on performance levels.
Argentina	105	In accordance with our previous comment, also considerations related to technical skills training/capacity building costs required.	Mention to cost for BEP was added.
Nigeria	112-124	Partnerships with Government/National laws, helps in the entrenchment of best environmental practices. Line 112-124 should also capture this.	Mention to national laws added.
Nigeria	115	Well-trained operator... RECAST to read "Skilled operators, that are sustainably trained and are aware of the need to pay attention to the processes....."	revised accordingly.
ICMM	119-124	We noted at the informal meeting of experts of 19/December 2022, that experts agreed to delete these lines of text as they are not directly related to control of mercury releases.	deleted.
Nigeria	129-130	...monitoring and measuring progress in achieving the objectives; ensuring employees' environmental awareness, acquaintance with national environmental laws and competence; and reviewing progress of the system and continuously improving it.	revised accordingly
Nigeria	132-158	This aspect should form the introductory part of chapter 3 since its focus is on Techniques.	Since this is about considerations in techniques, it can remain in chapter 2. Mention to specific techniques can be moved to chapters 3 or 4.
US	132-158	I am late to realizing how much the different versions of draft guidance have changed, but notice with concern the new sections on cross-media effects. Specifically, the discussion of air pollution control (cross media effects) without any reference to Article 8 is contrary to the previously understood implementation of the Convention.	Reference to article 8 was added, noting that article 8 only relates to sources listed in Annex D.

IPEN	141 - 142	It is not clear how <i>effluent sedimentation reduces mercury concentrations</i> . While inorganic mercury may partition to the sediment it will increase mercury concentrations in the sediment. Organic mercury compounds and specifically methyl mercury may increase in the liquid fraction during sedimentation due to bacterial action during the process. What sort of lining is required in the sedimentation pond to prevent mercury releases to groundwater? More detail and references required.	It is clear that sedimentation reduces mercury levels in wastewater, but the point raised can be captured as an issue for cross-media effect. Text added.
IPEN	150 - 151	More detail on release prevention from final disposal of sludges required. Specifically leachate collection and treatment to prevent groundwater contamination.	A section on landfill was added to chapter 4, largely referring to the technical guidelines under the Basel Convention.
Argentina	152-158	It is referring to a technique not described before and not explained. "There are techniques that may be used to control the releases of a range of pollutants, such as heavy metals. Consideration should be given to the advantages of using techniques capable of controlling several pollutants simultaneously to deliver mercury co-benefits. For instance, the treatment effectiveness concentrations used for chemical precipitation and sedimentation technology are based on optimized treatment for concomitant multiple metals removal, for example, coprecipitation of heavy metals in presence of Iron (a metal with the following characteristics: natural coagulation, adsorption of heavy metals onto iron solids) . Thus, even though metals have somewhat different theoretical solubilities, they will be removed at very nearly the same rate in a chemical precipitation and sedimentation treatment system operated for multiple metals removal. Consideration should be given to the advantages of using techniques capable of controlling several pollutants simultaneously to deliver mercury co-benefits. "	The comment will be reflected in the text.
ICMM	152	In light of the absence of an agreed criterion-based definition for a 'heavy metal' ", please delete the word "heavy" from this sentence.	Will be deleted.
IPEN	154 - 155	Sentence is unclear	Will be edited.
EU	161 - 162	These are general information of the forms of mercury which could occur in the environment. As highlighted in the General comment, this information should be addressed in a prefixed subchapter in Chapter I 'Introduction'.	Will be added.
Argentina	170 -1	Since there are different species of mercury, oxidation and reduction steps are important to ensure that all mercury present is converted to the species that is susceptible to the elected treatment.	The text does refer to different chemical species.
EU	177	It would be appropriate to add the expression 'e.g.' after ' <i>Suitable separation or clarification techniques include</i> ' to make clear that the list of those techniques is not exhaustive.	Edited
Alfa Laval Technologies	179	In the bullet list under section 3.1, the technology " <i>centrifugal separation</i> " is missing. The most logic place would be at line 179 as it is a sedimentation technique using significantly higher g-forces from rotation to greatly increase the sedimentation speed.	Added.

EU	179	It would be appropriate to specify/define what is meant by 'clarification'.	Will be edited.
Argentina	183	Clogging and blockage is an important issue to consider always in filtrating steps, maintenance associated too. First 4 physical techniques have the advantage of not having this issue, but filtration could be useful after them as a polishing technique, in order to preserve ion exchange membranes or other technology as described in this parragraph.	.Added to the text.
Alfa Laval Technologies	186	In the text, between "...prevent plugging." and "Solid-free...", the following description of centrifugal separation would be relevant: <i>Industrial centrifugal separators, like disc stack centrifuges utilizing high g-forces and short settling distance between discs, are able to continuously remove suspended particles all the way down to very small particle sizes 1-10 µm, typically for mercury contaminants. What's more, disc stack centrifuges can tolerate large variation of particle concentration in feed, making it a feasible technique in situations with changing solid contents.</i>	This information will be added to the technical reference document.
Argentina	196	Hydrogen sulfide presence is related to pH shifts.	Reference to pH control was added.
ICMM	197-198	For accuracy, please change to "harmful effects to occupational health, may be generated during the metal sulfide precipitation (MEE, 2012[47]). The simplified chemical reaction is illustrated below"	Edited.
Argentina	202	pH controlling step is missing.	Edited
Argentina	204	managed as solid waste and disposed of in an environmentally sound manner.	Will be edited.
ICMM	205-212	With reference to our general comment (above), we recommend that these lines be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	See general comment on performance levels.
Argentina	209-212 300 000 000	The technology used is missing, according to the guidance reference: "However, some of the processes used multiple precipitation steps and additional treatment with other technologies such as activated carbon to reach this level."	Edited.
Argentina	213	Most used but usually complemented with other techniques to achieve a better or more specific target. The best performances found consist on combinations of precipitation with filtration, co-precipitation, and adsorption.	Edited
ICMM	218-224	Ion exchange is not commonly used for mercury treatment, as it is more likely to be affected by characteristics of the media and contaminants other than mercury, than co-precipitation and sulfide precipitation (US EPA 2007). As such, adsorption and ion exchange are more appropriate for applications where mercury is the only contaminant to be treated, for smaller capacity systems, and for polishing of pre-treated effluent.	Added.
ICMM	225-226	With reference to our previous comment and our general comment (above), we recommend that these lines be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	Removed.

ICMM	228-242	Experts in industrial wastewater treatment from ICMM member companies recommend also mentioning other commonly used adsorbents such as sulfur-impregnated activated carbon, functionalized activated alumina, and self-assembled monolayers on mesoporous supports).	Edited.
Argentina	236	It is the first time that “removal by coalescence and recovery of metallic mercury” is addressed, it may be adequate to discuss it in the precipitation/physical separation techniques section.	Added a section on recovery of mercury through reduction and coalescence.
Argentina	238-242	In the technique analysis, activated carbon’s need to be periodically replaced should be mentioned.	Added.
ICMM	247	If reference 76 is the report that we are familiar with (Treatment Technologies for Mercury in Soil, Waste, and Water (clu-in.org), biological treatment is only presented as having been evaluated at the pilot-scale. Fate and transport of assimilated mercury associated with this technique (e.g., potential methylation) should be of concern. This description should therefore be removed from Guidance.	Text deriving from the EPA document on pilot-scale treatment was removed.
IPEN	262-264	More information required on managing chlor-alkali residues.	Specific reference to chlor alkali was removed. There is a dedicated section on chlor alkali. Section 4.
Argentina	266	More details are needed. What mercury source was addressed at pilot scales? Why is it effective?	This para on bioremediation was removed.
IPEN	269	Use of biomass for remedial absorption of mercury should contain disclaimers warning about the end use of the biomass. E.g. not for consumption, animal feed, firewood, composting etc to prevent further contamination/exposure. Must be regarded as waste for ESM.	Some text added.
ICMM	271-295	As Section 3.5 appears to deal with a variety of solid/liquid separation processes, and not just membrane filtration (i.e., separation of dissolved solutes), it is recommended to edit its title. Reverse osmosis is also a relevant process that could be described here.	The bullet points were confusing and therefore removed.
ICMM	291	With reference to our general comment (above), we recommend that this line be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally. Membrane filtration performance is defined by removal efficiency (rejection). Achievable concentrations depend on influent concentrations and rejection.	Removed, since there was no reference providing generally achievable concentration level.
ALMR	301-501	Most of these sections discuss technology and hardware systems for control. We recommend that actions taken by humans at any point in the life of lighting be added throughout. Technology does not break lighting and release mercury; humans do. It is important to stress how education, awareness, and some simple actions humans can take will result in billions of lighting devices <u>not</u> being broken and releasing mercury into the environment.	See general comment on lamp recycling.

ICMM	314-322	With reference to our general comment (above), we recommend that these lines be shifted to Chapter 3, as they describe common techniques that are applied across several potential sources of release.	This chapter described techniques for treatment of wastewater from APC systems and describes some of the relevant techniques included in chapter 3.
ICMM	317-318	With reference to our general comment (above), we recommend that the last sentence of this paragraph be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	Removed.
ICMM	320-322	With reference to our general comment (above), we recommend that the last sentence of this paragraph be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	Removed.
Argentina	333	Coal cleaning process is not described.	Already mentioned in first para of section 4.2.
ICMM	339-341	With reference to our general comment (above), we recommend that these lines be shifted to Chapter 3, as they describe common techniques that are applied across several potential sources of release.	This lines refer particularly to coal combustion section.
Jamaica	342	Replace the word 'indicted' with 'indicated'	Edited.
ICMM	342-344	With reference to our general comment (above), we recommend that this paragraph be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	Removed
EU	343	It would be appropriate to replace "ng/L" by "ng/l", for sake of consistency.	Editorial check will be done later.
OASIS	348, 349, 350, 351	To delete. This is incorrect information. In addition to hydrocarbons, the composition of oil includes S (0.5-6%), N (0.1-2.0%), O ₂ (0.05-1.5%) and metals such as Ni, V, Fe, Co. NO MERCURY OR ITS COMPOUNDS.	BREF and UNEP documents provide documentation on Hg in oil. It may be confusing to mention arsenic and vanadium so these were removed.
EU	350 - 351	It would be appropriate to move the information on the three forms of mercury in above-mentioned prefixed chapter (see general comment)	Added in chapter 1.
Alfa Laval Technologies	353	Insufficient description of presence of mercury in crude oil fluids than in natural gas production. Following paragraph is proposed: <i>In Natural gas production the gas stream may contain gas condensate. In mercury rich wells, the condensate stream will the also contain mercury in similar concentrations as seen I crude oil. Condensate may typically be stored in periods offshore in e.g., a Floating storage and offload unit (FSO) where particles including Mercury sediment and accumulate to high concentrations. Reported mercury levels in crude/condensate samples range from 0.5 to50,000 µg/kg (ppb) (Bloom 2020). Production platforms using glycol injection to avoid hydrates may find significant portions of the mercury contaminants present in the glycol stream in the downstream processing.</i>	This information will be considered for the future addition to the technical reference document.
Alfa Laval Technologies	357	Crude oil and condensate treatment description is missing. At row 357 the following is proposed. <i>Removal of mercury from crude oil prior to use, reduces the mercury in</i>	This information will be considered for the future addition to the technical reference document.

		<p><i>emissions from fossil fuel./ Removal of mercury from crude oil at the extraction stage, reduces mercury emissions in further refining and use of petroleum. For crude/condensate or glycol process streams, there could be a need to process condensate or glycol at the offshore installation, depending on geochemical background of mercury deposits in oilfields (Gallup 2014, Boschee 2015). Removal of mercury contaminant in a closed system may allow reinjection of contaminants to the formation. Mercury in crude oil is typically found adsorbed on very small particles residing in a narrow particle size range, 1-10 µm. Disc stack centrifuges in offshore operation have been proven to perform significant condensate mercury removal that continuously reduced mercury contaminants from levels of 8000 - 12000 ppb down to below 850 ppb (Manelius & Aguedach 2018). Traditionally the mercury removal has often been made with filtration, however filter handling is not only requiring more space, but also posing exposure hazards to maintenance personnel. Centrifugal separation of mercury contaminants from crude oil has proved to offer an enclosed continuous operation with a capability of removing micron level mercury contaminants at production scale.</i></p>	
IPEN	357	More information required on ESM for drilling muds and 'produced water' from extraction. Decommissioned gas/oil pipelines have very high mercury contamination levels and ESM should be suggested for these to prevent releases.	A sentence was added on the removal of mercury from water. Also mentioned ESM of sludges and demolition waste, although this is under Article 11.
Jamaica	362	The first 'is' in the sentence appears it should read as 'if'.	Editid.
ICMM	368-371	With reference to our general comment (above), we recommend that these lines be shifted to Chapter 3, as they describe common techniques that are applied across several potential sources of release.	This description refers to section 4.3 Oil and gas and to a typical oil refinery, rather than to a general description of technologies.
ICMM	371-377	With reference to our general comment (above), we recommend that these lines be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	Removed.
EU	375	It would be appropriate to delete the word 'database' as it appears consecutively twice.	This section was deleted.
ICMM	379-380	<p>Suitable references for drafting of this section may include:</p> <ul style="list-style-type: none"> - US Electric Power Research Institute, US EPA, and US DOE references/resources https://doi.org/10.1016/S0048-9697(00)00541-6 - Journal article on impacts of Chinese mercury mining https://doi.org/10.1002/9781119009115.ch9 - Control techniques for Hg-emissions from extraction https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=9100EJD5.txt - Brady, George S., Henry R. Clauser, and John A. Vaccari. Materials Handbook, 14th Edition. McGraw-Hill, 1997 - https://www.britannica.com/technology/mercury-processing - http://www.madehow.com/Volume-4/Mercury.html 	Although the provided references mainly describe general process of gold extraction and releases to air. Text was added to this section with information from UNEP document on mercury mining in Kyrgyzstan.

ICMM	384-386	For accuracy, please change “ Creation of waste rock and tailings during mining and beneficiation can lead to exposure of mercury-bearing minerals to oxygen and water, and leaching processes, which can result in mercury releases to water systems or in-which result in mercury release to soil. ”	Edited
ICMM	387-394	For increased relevance, please change to: “Metals commonly exist in nature as oxides, sulfides, or carbonates and the smelting process requires a chemical reaction in the presence of a reducing agent to liberate the metal (UNEP 2019b). At high temperatures mercury becomes highly volatile and is released to the gas phase, or may condense on fine particles produced in the processing (United Nations Environment Programme (2021). Therefore , thermal processing (such as smelting, roasting and other high temperature operations) of metallurgical raw materials have the potential to release mercury to the atmosphere, and appropriate air-pollution control techniques capture it in various liquid or solid forms. Such waste needs to be treated and/or disposed of in an environmentally sound manner to prevent releases of mercury to land or to water. (UNEP Global Mercury Partnership Study report on mercury from non-ferrous metals mining and smelting, Geneva).”	Edited
ICMM	403-404	For increased suitability, please change to: “ Non-recyclable or non-reusable water can be treated in order to minimise the concentration of pollutants such as metals, acidic substances and solid particles in the final effluents discharged to the aquatic environment. ”	Edited
ICMM	406-408	For accuracy, please change to: “ These techniques may be used together in series or in parallel depending on the water management plan of the site, and opportunities can also be taken to settle solids and/or precipitate metals before the process stream is mixed with other effluents. ”	Edited
ICMM	409-433	With reference to our general comment (above), we recommend that these references to achieved reductions be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	Removed from the guidance document while retaining in technical reference document.
Argentina	417	This is an example of the iron coprecipitation referred to previously.	This part is removed from the guidance document.
EU	417	It may be appropriate to replace ‘iron’ by ‘Fe’.	This part is removed from the guidance document.
Jamaica	417	There is use of chemical notation (FeCl3) and fully written names for chemicals (iron (III) sulphate). Suggest consistency with choice of one or the other, or use of them both (i.e. iron (III) chloride (FeCl3))	This part is removed from the guidance document.
ICMM	438-465	With reference to our general comment (above), we recommend that these references to US effluent limitations be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	Removed from the guidance document while retaining in technical reference document.

IPEN	484	There is no discussion on releases of mercury from secondary use of incineration bottom ash for construction material, soil amendment or other agricultural applications. This should be included.	Agricultural application etc is not included in the list of potentially relevant point sources.
ICMM	489-490	The suggested achieved concentration in these lines contradicts the information presented in Section 3. With reference to our general comment (above), we recommend that all references to achieved reductions be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	This specific information on the achievable levels for waste incineration effluent treatment will be useful for Parties.
ICMM	494-498	The suggested achieved concentrations in these lines contradict the information presented in Section 3. With reference to our general comment (above), we recommend that all references to achieved reductions be removed from the Guidance itself, as the incomplete set of specific circumstances described is not helpful in general guidance to be applied globally.	Specific information on the achievable levels for waste incineration effluent treatment will be useful for Parties. Duplicative information and information on regulatory levels was removed.

Input to reference documents and other input

Submitter	Page	Comment	Response
Argentina	2.5	Fulfilment of EPA Discharge Requirements for ARD Using Co-Precipitation Iron Process at Neutral PH. report	No reference to Hg reduction.
Argentina	3.3	Ion Exchange. Houserová P, Kubán P, Kubán V. Ion exchange preconcentration and separation of mercury species by CE with indirect contactless conductometric detection. Electrophoresis. 2006 Nov;27(22):4508-15. doi: 10.1002/elps.200600274. PMID: 17066384.	The article refers to an experiment rather than to a technology. It is mentioned that the proposed method may prove to be applicable as a rapid screening method for mercury speciation in environmental samples.
Argentina	Appendix	Removal of Mercury and Other Heavy Metals of Industrial and Contaminated Site Waste Waters by Organic Chelation, Coprecipitation, and High-Efficiency Particulate Removal. link . final report .	The project refers to an experiment rather than to a technology that was applied in a certain industry.
EU		Part I: Common Techniques: It may be appropriate to include in the introduction of Part I a general reminder of the techniques for removal solid content to ensure a parallelism with Chapter 3.1 of the Guidance document	Included
EU		Part II: Techniques for specific sources of releases: It would be appropriate to align the Guidance document and the Technical reference document in respect of the order of appearance of the different techniques.	Edited.
EU		Appendix 'Emerging techniques': It would be appropriate to rename the title of this Appendix as follows: 'Emerging and innovative techniques', to ensure consistency with the Guidance document	The title renamed
Alfa Laval Technologies		References	

		<ol style="list-style-type: none"> 1. Manelius T., Aguedach I., 2018. Efficient condensate mercury removal offshore, Paper presented at the Offshore Technology Conference, Houston, Texas, USA. OTC- 28743-MS, DOI: 10.4043/28743-MS 2. Boschee, P. 2015. Advancements in the removal of mercury from crude oil, Oil and Gas Facilities, DOI: 10.2118/0413-0012-OGF 3. Gallup, DL. 2014. Removal of mercury from water in the petroleum industry. IPEC 2014 – Second International Petroleum Environmental Conference 4. Bloom, N. 2000. Analysis and stability of mercury speciation in petroleum hydrocarbons. Fresenius J Anal Chem 366, 438–443. DOI: 10.1007/s002160050089 5. den Boestert, J.L., Nijmeijer, A. and van den Enk, L. 2021. Development in sustainable separation methods for condensates. Shell TechXplorer Digest 6. den Boestert, J.L., Nijmeijer, A. and Smit, C.J. 2008. Method for reducing the mercury content of natural gas condensate and natural gas processing plant. WIPO (PCT): WO2008116864A1 	<ol style="list-style-type: none"> 1. Refers to condensate mercury removal 2. Refers to removal of Hg from oil itself 3. Some information was picked from the reference 4. The article determination of Hg and some of its most important species in petroleum hydrocarbons 5. Not found 6. Reference in Korean language
ALMR	Part I- pages 1- 23	Part 1 discusses TECHNIQUES AND BEST ENVIRONMENTAL PRACTICES TO CONTROL MERCURY RELEASES TO LAND AND WATER FROM RELEVANT SOURCES. As discussed above, mercury lighting breakage and uncontrolled management presents the same problems as the other sources. The science, chemistry, and stoichiometry of mercury interactions with water, air and soil are the same from lighting as any of the other sources. Lighting is much more widespread, and the earth is impacted every day from millions of sources.	This guidance addresses relevant sources under Article 9. Consideration for lamp recycling is addressed in technical guidelines on the environmentally sound management of mercury waste.
ALMR		We request lighting be added to the list items in Part 1 and that statements reference our comments above, or some variation that explains the consequences of uncontrolled management.	
ALMR	Part II thru end of document	Again, all the environmental benefits, cross media effects and many of the technical considerations discussed in this Part also apply to mercury from lamps. Lighting presents a larger problem, yet the solutions are not as complex. Keeping lighting out of the environment is the only way to address this pollution. Technology and systems exist and are in place in many countries.	
ALMR		We urge you to incorporate lighting into the discussions and simply encourage countries and populations to nearly eliminate this problem by setting up simple systems with infrastructure to avoid uncontrolled breakage and the havoc that ensues. It all starts with avoiding throwing them in the trash.	

ICMM	all	The technical Annex summarizing reference documents still incorrectly describes only two forms of mercury in the environment: mercury dissolved in water and mercury adsorbed to particles. If the technical Annex is retained, reference should be made throughout the Annex, as is now done in the draft guidance document, to mercury that is neither dissolved, nor adsorbed, but rather present within the mineral matrix of particles.	Edited.
ICMM	17-21	The section on Biological Treatment includes “Aqueous Biocyanide Process”, (page 19), and a general description of an aerobic bioprocess and apparently a citation to a report from the US EPA – perhaps “Treatment technologies for mercury in soil, waste, and water,” US EPA, August 2007. Concerns about the fate and transport of assimilated mercury associated with this technique (e.g., potential methylation), should at least be mentioned in the reference document. Such techniques should consequently not be mentioned in the Guidance itself.	Edited.
ICMM	47-69	This discussion of BAT should also mention techniques related to the use of retorts in the gold-mining sector.	This document does not cover ASGM.
ICMM	64-69	The US EPA Effluent Limitations Guidelines in Table 18 are difficult to interpret without more information on their relation to achievable performance levels, which are in turn dependent on design basis, aqueous matrix, unit operations and reagents utilized, operating conditions (especially pH), equipment utilized, residuals management, etc. Such limitations are not necessarily helpful for informing users of the guidance on BAT/BEP measures to be taken in their own local circumstances.	Most of the tables cut and pasted have been removed.
IDM		Ref ISO 11143 : 2008 Dentistry – Amalgam separators This Standard was last reviewed and confirmed in 2022. Therefore this version remains current. (ISO website January 2023)	Information on dental offices will need to be added in the future update of the technical reference document.
IDM		Ref International Dental Journal February 2022 Amalgam (Part 1) : Safe Management of Waste and Mercury	Information on dental offices will need to be added in the future update of the technical reference document.