DOWNLOAD PDF DEVELOPING AMBIENT WATER QUALITY CRITERIA FOR MERCURY

Chapter 1 : Human Health Water Quality Criteria and Methods for Toxics | Water Quality Criteria | US EPA

In particular, mercury analyses of water before the mid- to lates should be treated with suspicion. Download PDF sample Developing Ambient Water Quality Criteria for Mercury: A Probabalistic Site-Specific Approach.

How can I find the use designations for my specific water body of interest? Go to rules to of the OAC. Each of those rules covers a major drainage basin. Use the Water Body Use Designation Index on that page to find the rule number and page number of your water body of interest. Ohio drainage basins and associated rule numbers in OAC Beneficial use designations describe existing or potential uses of water bodies. They take into consideration the use and value of water for public water supplies, protection and propagation of aquatic life, recreation in and on the water, agricultural, industrial and other purposes. Ohio EPA assigns beneficial use designations to water bodies in the state. There may be more than one use designation assigned to a water body. Examples of beneficial use designations include: Attainment of use designations is based on specific numeric and narrative criteria. To ensure protection of those beneficial uses, Ohio EPA determines and assigns maximum concentrations for over chemicals. Narrative "free froms", located in rule of the OAC, are general water quality criteria that apply to all surface waters. These criteria state that all waters shall be free from sludge, floating debris, oil and scum, color and odor producing materials, substances that are harmful to human, animal or aquatic life, and nutrients in concentrations that may cause algal blooms. Very important components of this evaluation are the biological survey program and the biological criteria used to judge aquatic life use attainment. Numeric criteria are estimations of concentrations of chemicals and degree of aquatic life toxicity allowable in a water body without adversely impacting its beneficial uses. Although numeric criteria are applied to water bodies, they primarily are used to regulate dischargers through NPDES permits. Numeric criteria consist of chemical criteria, whole effluent toxicity levels and biological criteria. In these studies, organisms are exposed to known concentrations of a chemical under varying conditions. For aquatic life water quality criteria, the organisms exposed are a variety of fish, benthic macroinvertebrates and zooplankton. For human health water quality criteria, the organisms exposed are mammals, usually mice or rats. Based on these tests, guidelines or national criteria recommendations are established by U. Another class of chemical criteria are those associated with the Agricultural Water Supply use designation. These criteria protect against long term adverse effects on crops and livestock as a result of crop irrigation and livestock watering. Chemical water quality criteria are in Chapter of the OAC. A bioassay or toxicity test measures the degree of response of an exposed test organism to a specific chemical or effluent. WET can only be measured using living organisms, not by an instrument. WET consists of acute and chronic toxicity tests. Acute toxicity tests measure the responses of organisms that occur soon after exposure to a test substance. Chronic tests measure the long-term response to test substances. WET measures the accumulative effects of chemicals present in an effluent that cannot be assessed using chemical-specific criteria. Provisions addressing whole effluent toxicity are in rule 44 , rule , and paragraph B of rule of the OAC. Biological Criteria Biological criteria are based on aquatic community characteristics that are measured both structurally and functionally. These criteria are used to evaluate the attainment of aquatic life uses. The data collected in these assessments are used to characterize aquatic life impairment and to help diagnose the cause of this impairment. These three indices are based on species richness, trophic composition, diversity, presence of pollution-tolerant individuals or species, abundance of biomass, and the presence of diseased or abnormal organisms. Ohio EPA uses the results of sampling reference sites to set minimum criteria index scores for use designations in water quality standards. Provisions addressing biological criteria are in paragraph C of rule of the OAC. The antidegradation provisions describe the conditions under which water quality may be lowered in surface waters. Existing beneficial uses must be maintained and protected. Further, water quality better than that needed to protect existing beneficial uses must be maintained unless lower quality is deemed necessary to allow important economic or social development existing beneficial uses must still be protected. Provisions addressing antidegradation are in rule and rule of the OAC. Any interested individuals can have a role in the process of developing water quality standards. Ohio EPA reviews and, as appropriate, revises water quality standards at least once every three years. When water quality standards revisions are proposed, the public is notified of these revisions. A public hearing is held to gather input and comments. Summary Tables These tables summarize aquatic life and human health numerical water quality criteria and values contained in and developed pursuant to Chapter of the Ohio Administrative Code. The Lake Erie table was last updated on Feb. The Ohio River table was last updated on February 3,

Chapter 2 : Ecological Risk Assessment Screening Benchmarks | Region 5 Superfund | US EPA

This project examined the development of ambient water quality criteria (AWQC) for the protection of wildlife for mercury. Mercury is considered a serious risk to wildlife in many areas. As a result, the Great Lakes Water Quality Initiative and others have developed AWQC.

Environmental Proceccion Agency, and approved for publication. Mencion of trade natnes or coiuraerc. This document is a revision of proposed criceria based upon a conaideracion of conniencs received from ocher Federal agencies, Scace agencies, special inceresc groups, and individual scientiscs. The criceria contained in chis documenc replace any previously published EPA aquacic life criceria. The cenn "wacer qualicy criceria" is used in cwo seccions of che Clean Wacer Acc, seccion a 1 and seccion c 2. The cerm has a differenc program impacc in each seccion. In section , che cerra represencs a non-regulatory, scientific assessment of ecological effeccs. The criteria presented in chis publication are such sciencific assessments. Such water qualicy criceria associaced wich specific scream uses when adopced as Scate wacer qualicy scandards under seccion become enforceable maximum accepcable levels of a pollucanc in ambienc waters. The water quality criceria adopced in che Scate water quality standards could have che same numerical liraics as che criceria developed under seccion However, in many situations Scates may want co adjusc wacer qualicy criceria developed under seccion co reflecc local environmencal condicions and human exposure paccerns before incorporation into water quality scandards. Ic is noc uncil cheir adopcion as pare of che Scate water quality standards chac che criceria become regulatory. Guidelines to assist the States in the modification of criceria presenced in chis document, in the development of water quality scandards, and in ocher wacer-relaced programs of chis Agency, have been developed by EPA. Acuce Toxicicy of Mercury co Aquacic Animals 26 2. Chronic Toxicicy of Mercury co Aquacic Animals 36 3. Toxicicy of Mercury co Aquacic Planes 44 5. Bioaccumulacion of Mercury by Aquacic Organisms 46 6. Research Council Canada, ; Nriagu, Elemental mercury is a heavy liquid ac room temperature and was considered relatively inert, because it was assumed chat it would quickly settle to che bottom of a body of wacer and remain there in an innocuous scate. However, elemental mercury is oxidized to mercury II under natural conditions Wood, Furthermore, mercury II , whether discharged directly or produced from elemencal mercury, can be mechylated by both aerobic and anaerobic bacteria Akagi, ; Beijer and Jernelov, ; Callahan, et al. Mercury II can also be methylated in the slime coac, liver, and incescines of fish Jernelov, ; Matsumura, ec al. The certn "mechylmercury" is used herein co refer only to monomechyIraercury, and not to dimethylmercury or any other monoorganomercury salt or diorganomercury compound. Inorganic tnercury II will be referred to as "mercury II ". The imporcance of methylation may be reduced by demethylation Bisogni, ; Raraamoorthy, et al. Demechylacion also occurs in fish Burrows and Krenkel, ; de Freicas, ec al. Numerous faccors such as alkalinicy, ascorbic acid, chloride, dissolved oxygen, hardness, organic coraplexing agencs, pH, sedimenc, and cemperacura probably affecc the acuce and chronic coxicicy and bioaccurauLacion of che various forms of mercury Amend, ec al. A variecy of scudies have been conducced on the effecc of selenium on che acuce coxicicy of mercury e. Available data do not, however, show chat quanticacive relationships are consiscenc enough for a variety of aquatic species co enable relating wacer quality criteria to any of these variables. Because of the variety of forms of inorganic and organic mercury and lack of definitive information about their relative coxicicies, no available 2 analytical measurement is known co be ideal for expressing aquatic life criteria for mercury. Previous aquacic life criteria for mercury U. EPA, were specified in terras of cocal recoverable mercury, which would probably be measured as cocal mercury U. EPA, a , buc boch of chese measureraencs are probably coo rigorous in some sicuacions. Acid-soluble mercury operacionally defined as che mercury chac passes through a 0. This measuremenc is compacible wich all available daca concerning coxicicy of mercury co, and bioaccumulacion of mercury by, aquacic organisms. No cesc resulcs were rejecced jusc because ic was likely chac chey would have been subscancially differenc if chey had been reporced in cerms of acid-soluble mercury. For example, resulcs reporced in cerms of dissolved mercury would noc have been used if che concencracion of precipicaced mercury was subscancial. On samples of ambienc wacer, measuremenc of acid-soluble mercury should measure all forms of mercury chac are coxic co aquacic life or can be readily converted co coxic forms under natural condicions. In addition, this measuremenc should noc measure several forms, such as mercury chac is occluded in minerals, clays, and sand or is scrongly sorbed co particulate maccer, chac are noc coxic and are noc likely to become coxic under natural conditions. Although this measurement and many ochers will measure soluble, complexed forms of mercury, such as che EDTA complex of mercury II , chac probably have low coxicicies co aquacic life, concentrations of chese forms probably are negligible in most ambient wacer. Although wacer quality criceria apply co ambienc water, the measurement used CO express criteria is likely co be used co measure mercury in aqueous effluencs. Measurement of acid-soluble mercury should be applicable co effluencs because ic will measure precipicates, such as carbonate and hydroxide precipitates of raercury II , that might exisc in an effluent and dissolve when che effluenc is diluced with receiving wacer. If desired, dilution of effluent with receiving water before measurement of acid-soluble mercury mighc be used co determine whether che receiving wacer can decrease che concentration of acid-soluble mercury because of sorption. The acid-soluble measurement should be useful for raosc niecals, chus minimizing che number of samples and procedures chat are necessary. The acid-soluble neasuremenc does not require filcracion ac che cime of collection, as does che dissolved measurement. Durations of 10 minuces co 24 hours between acidification and filtration probably will not affect che resulc substantially. Differences in pH wichin che range of 1. After acidification and fiLcracion of che sample co isolate the acid- soluble mercury, the analysis for cocal acid-soluble mercury can be performed using permanganate and persulfate oxidation and cold vapor atomic absorption U. CPA, a , as with the total measuremenc. Mechylmercury has been measured using gas chromatography Cappon, ; Hildebrand, ec al. Thus, expressing aquacic life criceria for mercury in cerms of che acid- soluble measurement has boch coxicological and praccical advantages. On the ocher hand, because no measurement is known to be ideal for expressing aquacic life criteria for mercury or for measuring mercury in ambienc wacer or aqueous effluencs, measurement of both total acid-soluble mercury and total mercury in ambienc wacer or effluenc or boch mighc be useful. For example, there might be cause for concern if total mercury is much above an applicable limit, even chough total acid-soluble mercury is below the limit. Unless otherwise noted, all concentrations reported herein are expected co be essentially equivalent co acid-soluble mercury concencracions. All concencracions are expressed as mercury, noc as che chemical cesced. The criceria presented herein supersede previous aquacic life water quality criceria for mercury U. EPA, , because these new criteria were derived using improved procedures and addicionaL information. Whenever adequately justified, a national cricerion may be replaced by a sice-specific criterion U. EPA, b , which may include noc only sice-specific cricerion concencracions U. EPA, c , buc also site-specific durations of averaging periods and sice-specific frequencies of allowed exceedences U. The lacesc liceracure search for informacion for chis document was conducced in May, ; some newer information was also used. The latter information exists principally because many of chese compounds were considered for use in treatment of diseases and control of parasites in fish culture, although their source for environmental concern is from industrial and agricultural uses for fungus control. Both phenyl- mercuric acetate and pyridylmercuric acetate have been called PMA. Tests have been conducted on different formulations which contain various percentages of active ingredient and the percentages of active ingredient given by the authors were used to calculate mercury concentrations. When the percentage of active ingredient was not given for pyridylmercuric acetate, 80 percent was assumed Allison, The freshwater acute toxicity values indicate that the difference in sensitivity between different species to a particular mercury compound is far greater than the difference in sensitivity of a particular species to various mercury compounds. For example, the reported acute values for mercury II range from 2. MacLeod and Pessah studied che effect of temperacure on the acute toxicity of mercuric chloride to rainbow crout. Clemens and Sneed b found a similar effect of cemperature on coxicicy to 6 juvenile channel catfish; ac 10, Acute values are available foe more chan one species in each of cwo genera, and the range of Species Mean

Acuce Values wichin each genus is less chan a faccor of 1. On che ocher hand, a midge was among che mosc sensitive species, whereas ocher insects were che mosc resiscanc species. The raosc sensitive genus, Daphnia, is cimes more sensitive chan the most resiscanc, Acroneuria Table 3. A freshwacer Final Acuce Value of 4. Noc enough daca are available co calculace a Final Acuce Value for mechylmercury, but che available daca indicace chac ic is more acucely toxic chan mercury II. Saltwater fishes and invertebrates both show wide ranges of sensicivi- cies co raercury II. Among invercebrates a -nysid has an acute value of 3. Of che 29 saltwater genera for which acute values are available, che mosc sensitive, Mysidopsis, is times more sensicive than the mosc resiscanc, Pseudopleuronecces. Acuce values are available for more chan one species in each of three genera and che range of Species Mean Acuce Values wichin each genus is less chan a faccor of 1. The saltwater Final Acute Value of 4. In addicion, a chronic cesc wich brook trout on mechylmercuric chloride yielded a chronic value of 0. Boch an early life-acage cest and a life-cycle cesc on mercuric chloride found adverse effeccs on che fachead minnow ac all concencracions cested including che lowesc of 0. For mercuric chloride che acuce-chronic racio wich Daphnia magna is less chan 6, whereas chac wich che fachead minnow is greacer chan For mechylmercury che acuce-chronic racio wich brook crouc is A chronic value of 1. No spawning occurred ac 2. Time co spawn and produccivicy ac 1. The highesc concentration at which no scaciscically significanc effect on reproductive processes was dececced was 0. Therefore, che chronic limics are 0. The hr LC50 for chis species in che same scudy was 3. The species mean acuce-chronic racio for Daphnia magna is 4. These are sensitive species in fresh and sale wacer, respectively, and che four mosc sensicive species in each 8 Bioaccumulacion Bioconcencracion is a funccion of che relative races of uptake and depuracion. The bioconcencracion Eaccor BCF of mercury is high for fish because upcake is relatively fasc and depuracion is very slow. Thus, che bioLogical half-life of mercury in fish is approximacely 2 to 3 years de Freicas, ec al. Depuracion of mercury is so slow chat, even in che absence of exposure co mercury, long-cerm reduccion in che cancencracion of mercury in fish cissue is largely due co dilucion by cissue addicion from growch. Usually less chan 60 percenc of mercury in invercebraces is mechylaced, but in fish, excepc for young fish, usually more chan 70 percenc is raechylaced Bache, ec al. The discribucion of mercury wichin a fish is che resulc of che movement of mercury from che absorbing surfaces gills, skin, and gascroincescinal cracc , inco che blood, chen co che incernal organs, and evencually either co che kidney or bile for recycling or elimination or co muscle for long-cerm storage. As che cissue concencracion approaches sceady-scace, nec accumulation race is slowed either by a reduccion in upcake race, possibly due co inhibicion of membrane cransporc, or by an increase in depuracion race, possibly because of a sacuraciort of scorage sices, or boch. High concentracions of mercury in che slime coac of cercain freshwater fishes, such as burbot, eels, and norchern pike, and in che skin of acuuely- exposed fishes are believed co be due co che mechylacing accivicy of bacceria prevalenc in che mucous coac Jernelov, In addicion, acutely coxic concencraciona of mercury have been reported co scimulace secrecion of mucus Baker, ; Lock, et al.

Chapter 3 : Ambient Water Quality Criteria for Mercury

This table contains the most up to date criteria for aquatic life ambient water quality criteria. Aquatic life criteria for toxic chemicals are the highest concentration of specific pollutants or parameters in water that are not expected to pose a significant risk to the majority of species in a.

Environmental Protection Agency, and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use. Proposed water quality criteria for the 65 toxic pollutants listed under section a l of the Clean Water Act were developed and a notice of their availability was published for public comment on March 15, 44 FR , July 25, 44 FR , and October 1, 44 FR This document is a revision of those proposed criteria based upon a consideration of comments received from other Federal Agencies, State agencies, special interest groups, and individual scientists. The criteria contained in this document replace any previously published EPA criteria for the 65 pollutants. This criterion document is also published in satisifaction of paragraph 11 of the Settlement Agreement in Natural Resources Defense Council, et. The term "water quality criteria" is used in two sections of the Clean Water Act, section a l and section c 2. The term has a different program impact in each section. In section , the term represents a non-regulatory, scientific assessment of ecological ef- fects. The criteria presented in this publication are such scientific assessments. Such water quality criteria associated with specific stream uses when adopted as State water quality standards under section become enforceable maximum acceptable levels of a pollutant in ambient waters. The water quality criteria adopted in the State water quality standards could have the same numerical limits as the criteria developed under section However, in many situations States may want to adjust water quality criteria developed under section to reflect local environmental conditions and human exposure patterns before incorporation into water quality standards. It is not until their adoption as part of the State water quality standards that the criteria become regulatory. Guidelines to assist the States in the modification of criteria presented in this document, in the development of water quality standards, and in other water-related programs of this Agency, are being developed by EPA. Environmental Protection Agency John H. Environmental Protection Agency Leonard T. Environmental Protection Agency Rudy J. For total recoverable mercury the criterion to protect saltwater aauatic life as derived using the Guidelines is 0. Criteria reflect ingestion of marine organisms as well as fresh- water and estuarine fish and shellfish. Mercury is a silver-white metal, atomic weight A liquid at room temperature, its melting point is The metal is insoluble and is not attacked by water. Mercury exists in a number of forms in the environment. Mercurous salts are much less soluble in water. HgN03 will solubilize only in 13 parts water containing 1 per- cent HN Hg2Cl2 is practically insoluble in water. Because of this, mercurous salts are much less toxic than the mercuric forms Stecher, The Department of the Interior carried out a nationwide reconnaissance of mercury in U. The higher mercury concentrations were generally found in small streams. About half of the 43 samples from the Mississippi River contained less than 0. The mercury content of lakes and reservoirs was between 0. With few exceptions, the mercury content of groundwater samples was below detection 0. Of these, or Eleven of the supplies had mercury concentrations of 1. When this one supply was extensively reexamined, the mercury concentration was found to be less than 0. In a study of Pacific waters, mercury concentra- tions were found to increase from surface values of about 0. In an area seriously affected by pollution Minamata Bay, Japan , values ranged from 1. The National Re- search Council has shown typical oceanic values for mercury to be 0. A major use of mercury has been as a cathode in the electrolytic prepar- ation of chlorine and caustic soda; this accounted for 33 percent of total demand in the United States in Electrical apparatus lamps, arc rect- ifiers, and mercury battery cells accounted for 27 percent, industrial and control instruments switches, thermometers, and barometers , and general laboratory applications accounted for 14 percent of demand. Use of mercury in antifouling and mildew proofing paints 12 percent and mercury formula- tions used to control fungal diseases of seeds, bulbs, plants, and vegteta- tion 5 percent were other major utilizations, however, mercury is no long- er registered by the EPA for use in antifouling paints or for the control of A-2 fungal diseases of bulbs. The remainder 9 percent was for dental amal- aams, catalysts, pulp and paper manufacture, Pharmaceuticals, and metallurgy and mining. Several forms of mercury, ranging from elemental to dissolved inorganic and organic species, are expected to occur in the environment. The finding that certain microorganisms have the ability to convert inorganic and organ- ic forms of mercury to the highly toxic methyl or dimethyl mercury has made any form of mercury highly hazardous to the environment Jensen and Jerne- lov, In water, under naturally occurring conditions of pH and tem- perature, inorganic mercury can be coverted readily to methyl mercury Bisogni and Lawrence, Mercury is able to form a series of organometallic compounds with alkyl, phenyl, and methoxyethyl radicals. Methylation of mercury in aerobic and anaerobic environments. Center, Ithaca, New York. Mercury in drinking water supplies. Mercury in waters of the United States, Biological methylation of Nature. An assessment of mercury in the environ- ment. Mercury in the environment: Elemental mercury, which is a heavy liauid at room temperature, was considered relatively inert. It was thought that it would auickly set- tle to the bottom of a body of water and remain there in an innocuous state. However, elemental mercury can be oxidized in sediment to divalent mercury Wood, Furthermore, both aerobic and anaerobic bacteria have been found capable of methylating divalent mercury in sediments The Nation- al Research Council, and estuarine areas Jernelov, This me- thylated form is more water soluble and more biologically active than ele- mental and inorganic divalent mercury Fromrn, ; Armstrong and Scott ; Jernelov, et al. Largely because of bacterial methylation, mercury is much more of a serious threat to the aauatic environment than was suspected. Mercury is one of the few pollutants that, at about the same concentrations in water, adversely affects aauatic life through direct toxicity and affects uses of aauatic life through bioaccumulation. Bioac- cumulation has received more attention because of potential adverse effects to humans. Methylmercury is more toxic than inorganic mercury to mammals as well as aauatic life, and mercury has no known physiological function. The following tables contain the appropriate data that were found in the literature, and at the bottom of each table are calculations for deriving various measures of tox- icity as described in the Guidelines. Even in situations in which no organic mercury was known to have been discharged, methylmercury was the dominant form in tissue resi- dues Jernelov and Lann, The methylated form is of great concern be- cause it comprises most of the mercury residue in tissues of anuatic organ- isms Hattula, et al. Defining the toxicity of mercury residues to humans, and probably other consumers of aouatic life, is complicated by the effect of selenium on the toxicity of mercury Strom, et al. The FDA action level of 1. Once methylation takes place, uotake by aouatic life is extremely rapid, and demethylation is a very slow process McKim et al. Deouration by excretion through the kidney reportedly reouires demethylation Burrows and Krenkel, In freshwater fishes, initial elimination of mercury just after the end of exposure is relatively rapid, due to sluffing of the slime coat Burrows and Krenkel, and elimination of non-methylated mercury. Once methylmercury becomes securely bound to sulf- hydryl groups in muscle proteins, subsequent loss proceeds at a much reduced rate. In fact, long term reduction of the concentration of mercury in fish tissue is largely due to dilution by tissue addition resulting from growth Lockhart, et al. High mercury concentrations in slimy freshwater fishes such as burbot, eels, and northern pike, and in the skin of acutely-exposed fishes are believed due to the methylating activity of bacteria prevalent in the mucous coat Jernelov, Acutely toxic concentrations of mercury have been re- ported to stimulate mucous secretion McKone, et al. However, these are the layers of the fish that are first encountered as mercury moves from the environment into a fish, and in acute exposures the mercury does not have time to be transported to the final sink - the proteins whose greatest mass are in the axial muscle McKim, et al. Numerous data are available concerning the effect of phenylmercuric ace- tate PMA on anuatic organisms, because of its use as a fungicide and its use to treat fish diseases. Many tests have been conducted on different PMA formulations which contain various percentages of active ingredient. The percentages of active ingredient given by the authors were used to convert to concentrations of mercury. When the percentage of active ingredient was not given, 80 percent PMA was assumed Allison, Of the analytical measurements currently available, water duality crite- ria for mercury are probably best stated in terms of total recoverable mer- cury, because of the variety of forms of mercury than can exist in bodies of water and the various chemical and toxicological properties of these forms. The forms of mercury that are commonly found in bodies of water and are not B-3 measured by the total recoverable procedure, such as the mercury that is a part of minerals, clays and sand, probably are forms that are less toxic to aauatic life and probably will not be readily converted to the more toxic forms under natural conditions. On the other hand, forms of mercury that are commonly found in bodies of water and are measured by the total recover- able procedure, such as the free ion, the hydroxide, carbonate, and sulfate salts, and the organic compounds, probably are forms that are more toxic to aauatic life or can be converted to the more toxic forms under natural con- ditions. Because the criteria for mercury are derived on the basis of tests conducted on soluble inorganic salts of divalent inorganic mercury and mono- methylmercuric chloride, the total and total recoverable concentrations in the test should be about the same. Except as noted, all concentrations re- ported herein are expected to be essentially equivalent to total recoverable mercury. All concentrations are expressed as mercury, not as the compound. The latter information exists principally because many of these compounds have been used for disease treatment and parasite control in fish cultural practices, though their source for environmental concern is from industrial and agricultural uses for fungus control. A striking feature of the freshwater acute toxicity values is that the difference in sensitivity between different types of or- ganisms to a particular mercury compound is far greater than the difference in sensitivity of a particular species to various mercury compounds. For inorganic mercury, the reported hour LC5Q values range from 0. Data are insufficient to make such comparisons for other two classes of mercury compounds. Rainbow trout are the most acutely sensitive of the tested fish species to all three kinds of mercury compounds and methylmercuric chloride is about ten times more acutely toxic to rainbow trout than is mercuric chloride. MacLeod and Pessah studied the effect of temperature on the acute toxicity of mercuric chloride to rainbow trout. Clemens and Sneed found similar temperature effects with mercury exposures at 10, A freshwater Final Acute Value of 0. This value should be useful because it is based on data for eleven species, even though acute data are not available for any non-salmonid fish. Acute values for mercuric chloride are available for 26 species of salt-water animals from 5 phyla Table 1. Fishes were generally more resistant to mercuric chloride than the crusta-ceans and molluscs. The saltwater Final Acute Value for inorganic mercury, derived from the species mean acute values in Table 3 using the calculation procedures described in the Guidelines is 3. Chronic Toxicity Chronic toxicity tests with Daohnia magna have been conducted on three different kinds of mercury compounds and the chronic values were all between 1.

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Chapter 4 : Water Quality Standards

Overview This project examined the development of ambient water quality criteria (AWQC) for the protection of wildlife for mercury. Mercury is considered a serious risk to wildlife in many areas.

PAHs, additional pesticides, additional inorganics The Ecological Soil Screening Level Eco-SSL derivation process represents the collaborative effort of a multi-stakeholder workgroup consisting of federal, state, consulting, industry and academic participants led by the U. It is emphasized that the Eco-SSLs are soil screening numbers, and as such are not appropriate for use as cleanup levels. Screening ecotoxicity values are derived to avoid underestimating risk. Requiring a cleanup based solely on Eco-SSL values would not be technically defensible. The Eco-SSL web site provides an overview of the contaminant. Separate discussions are provided for each receptor group including a comprehensive list of literature evaluated under the effort, and a summary of data used in deriving Eco-SSL values. Calculation and evaluation of sediment effect concentrations for the amphipod Hyalella azteca and the midge Chironomus riparius. Suter II, and R. The representative effect concentration selected from among the high no-effect-concentrations for Hyalella azteca and Chironomus riparius are presented in EPA based on the ranking method presented in Jones et al. The majority of the data are for freshwater sediments. These values facilitate consistency in screening level ecological risk assessments throughout Region III. Marine and freshwater sediment, surface water Contaminants: PCBs and pestcides; PAHs and other organics; inorganics The tables include compounds for which benchmark values have been established or that are considered bioaccumulative compounds identified in tables. Region 4 Bulletins No. Office of Health Assessment. Values presented are as updated Aug. Soil, sediment, surface water Contaminants: PCBs and pestcides; PAHs and other organics; inorganics The Region 4 surface water screening values were obtained from Water Quality Criteria documents and represent the chronic ambient water quality criteria values for the protection of aquatic life. These are possible effects benchmarks. They are not intended to serve as cleanup levels. Army Corps of Engineers U.

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This project examined the development of ambient water quality criteria (AWQC) for the protection of wildlife for mercury. Mercury is considered a serious risk to wildlife in many areas.

Contact Us Fact Sheet: The Ambient Water Quality Criteria National Guidelines outline the methodology used by states and tribes to develop human health water quality criteria. Revisions to the guidelines incorporate significant scientific advances in key areas such as cancer and non-cancer risk assessments, exposure assessments, and bioaccumulation in fish. The revised methodology will provide more flexibility for decision-making at the state, tribal and EPA regional levels. It is most likely that the methodology will result in more stringent criteria for bioaccumulatives and generally similar values of nonbioaccumulatives. Human health criteria are developed under Section a of the Clean Water Act of and are designed to protect human health. Water quality criteria are developed by assessing the relationship between pollutants and their effect on human health and the environment. These criteria are used by states and Indian tribes to establish water quality standards and ultimately provide a basis for controlling discharges or releases of pollutants. These national guidelines addressed three types of endpoints: The states and tribes use these criteria to develop water quality standards for each water body. EPA is required to review periodically criteria adopted by states and tribes. They provide detailed means for developing water quality criteria, including systematic procedures for evaluating cancer risk, noncancer health effects, human exposure, and bioaccumulation potential in fish. EPA Methodology for Deriving Criteria States and tribes must develop water quality standards that include designated uses and water quality criteria necessary to support those uses. The Methodology is the guidance for states and tribes to help them establish water quality criteria and standards to protect human health. It provides detailed means for developing the water quality criteria, including systematic procedures for evaluating cancer risk, noncancer health effects, human exposure, and bioaccumulation potential in fish. Risk assessment practices have evolved significantly since , particularly in the areas of cancer and noncancer risk assessments with new information, procedures, and numerous published Agency guidelines , exposure assessments with new studies on human intake and exposure patterns, and new science policy guidelines and methodologies on accounting for bioaccumulation in fish. General Background of the Revision Process Revisions began with a national workshop in , where participants discussed critical issues. Based on individual expertise, attendees were assigned to technical workgroups including cancer risk, noncancer risk, exposure, and bioaccumulation in fish. EPA created a workgroup in , including program office and regional participants, to revise the methodology. Following publication of the draft Methodology revisions, written public comments were accepted. In May , a peer review workshop was held. A public stakeholders meeting was also held then. EPA received extensive input on the Methodology from each of these groups. Major Methodology Revisions Publication of final revisions satisfies the requirements of the CWA that EPA periodically revise criteria for water quality to reflect accurately the latest scientific knowledge on the kind and extent of all identifiable effects on health and welfare that may be expected from the presence of pollutants in any body of water. These Final AWQC Methodology Revisions to the AWQC National Guidelines are necessitated by the many significant scientific advances made during the past 20 years in the key areas of cancer and noncancer assessments, exposure assessments, and bioaccumulation in fish. The major revisions are in four assessment areas: For carcinogen cancer risk assessment: Recommend more sophisticated methods to comprehensively determine the likely mechanism of human carcinogenicity. Recommend a mode of action MOA approach to determine the most appropriate low- dose extrapolation for carcinogenic agents. Recommend consideration of other issues related to the RfD process including: Recommend the use of quantitative dose-response modelling for the derivation of RfDs. Provide guidance for states and tribes on the use of an alternative value from the RfD point estimate, within a limited range, to reflect the inherent imprecision of the RfD. Encourage states and tribes to use local studies on fish consumption that better reflect local intake patterns and choices.

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Recommend default fish consumption values for the general population, recreational fishers and subsistence fishers. Account for other sources of exposure, such as food and air, when deriving AWQC for noncarcinogens and nonlinear carcinogens. Focus on the use of bioaccumulation factors BAFs , instead of bioconcentration factors BCFs for estimating potential human exposure to contaminants via the consumption of contaminated fish and shellfish. Use high quality field data over laboratory or model-derived estimates for deriving BAFs, since field data best reflect factors which can affect the extent of bioaccumulation e. EPA does not plan to completely revise all of the criteria developed in or those updated as part of the National Toxics Rule. Partial updates of all criteria may be necessary. EPA will continue to develop and update toxicology and exposure data needed in the derivation of AWQC that may be impractical for the states and regions to obtain. The development of revised criteria for chemicals of high priority and national importance including, but not limited to, chemicals that bioaccumulate, such as PCBs, dioxin, and mercury. The development or revision of AWQC for some additional priority chemicals. EPA encourages states and tribes to use the revised methodology to develop or revise AWQC to reflect local conditions appropriately. EPA believes that AWQC inherently require several risk management decisions that are, in many cases, better made at the state and regional level e. EPA believes the AWQC require several risk management decisions that are often better made at the state, tribal and regional level. The methodology will probably result in more stringent criteria for bioaccumulatives due to the use of BAFs instead of BCFs and generally similar, or less stringent, values of nonbioaccumulatives. How do I get a copy of this technical support document?

Chapter 6 : Developing Ambient Water Quality Criteria for Mercury: A by PDF - The BP Claims Books

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Chapter 7 : State of Oregon: Water Quality - Water Quality Standards

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Chapter 8 : Developing Ambient Water Quality Criteria for Mercury

EPA's Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health is used in the development of EPA's recommended criteria and offered as guidance for states and tribes in developing their own criteria.

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