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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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DRAFT

US Environmental Protection Agency
Hudson River PCBs Reassessment Remedial Investigation/Feasibility Study (RRI/FS)
Community Interaction Program

Joint Liaison Group Meeting
September 23, 1998
Latham, NY

On September 23, 1998, a Joint Liaison Group meeting was held at the Holiday Inn Express, Latham, NY to discuss the scopes of work for the ecological risk assessment and the feasibility study (FS). The agenda for the meeting is Attachment 1. Sign-in sheets are found in Attachment 2. The use of brackets - [ ] - indicates clarifications made by the writer in cases where unclarified text would be unclear to those not at the meeting. Copies of the audio tapes recorded at the meeting are available on request.

Ann Rychlenski, United States Environmental Protection Agency (EPA) Public Affairs Specialist and Community Relations Coordinator for the Hudson River PCBs RRI/FS, opened the meeting. Gina Ferreira, environmental scientist with EPA, made the first presentation covering the scope of work for the ecological risk assessment.

Ms. Ferreira explained that an ecological risk assessment is a requirement of the Superfund RI/FS process, as is the human health risk assessment. The results of these risk assessments are used in the remedy selection process. The three areas of concern in this scope of work are the upper Hudson River (entirely fresh water), the Thompson Island Pool, and the lower Hudson River (brackish, fresh water, and estuarine), all of which have different qualities in water types and concentrations of PCBs and contain several significant habitats.

Ms. Ferreira then went through the eight-step ecological risk assessment process, a schematic of which can be found in Attachment 3, along with a glossary of terms associated with ecological risk assessments. A copy of the slides used in the remainder of Ms. Ferreira's presentation are found in Attachment 4.

Doug Tomchuk, EPA Project Manager for the RRI/FS, presented an overview of the scope of work for the FS. Mr. Tomchuk began by reviewing the purpose of the Reassessment, which is to determine the proper course of action to address the PCB-contaminated sediments in the upper Hudson River, and the three phases of the Reassessment process itself; the Feasibility Study is Phase 3 of the overall process. Much work has been done to date to analyze the [river] system and to study the fate and transport [of sediments and PCBs], and this will all be used in the remedial action decision-making process.

Mr. Tomchuk reviewed the current Reassessment schedule and then discussed FS activities, which basically entail development and screening of alternatives, followed by detailed analysis of certain specific alternatives [to assist in reaching a recommended course of action]. He stressed that the FS process is an iterative one involving continual assessment and screening of technologies and processes to find a solution for the site. The final screening is done in the detailed analysis.

One part of the process for developing options for remediation is development of "remedial action objectives." This entails specifying the contaminants (in this case PCBs), the media of interest to be addressed in remediation (primarily the sediments), and the exposure pathway (consumption of fish is the primary exposure). Preliminary remediation goals are then developed. These objectives are not final cleanup standards to be met at the end [of the remediation]; the objectives constitute a range of numbers in treatment techniques and processes that can be used in developing the alternatives.

Part of the process of developing remedial action objectives is consideration of Applicable or Relevant and Appropriate requirements, or ARARs. These are local, state, or federal standards that might apply to a site. Models and risk assessments will also be used in development of remedial action objectives. Mr. Tomchuk reviewed the alternatives being addressed via models. Twenty different remedial action alternatives will be examined in this manner in the FS.

With regard to the No Action alternative - often referred to as "No Further Action" - Mr. Tomchuk pointed out that consideration of No Action is required by law, and serves as a baseline condition against which other alternatives are evaluated. This alternative involves no active remediation and no further institutional controls, but continued monitoring. The Monitored Natural Attenuation alternative differs from the No Action alternative in that there are baseline conditions identified that do present a risk or exceed state and/or federal standards requirements. In this case, EPA assesses the time frame estimated for the system to recover on its own and compares it to the active remediation alternatives to determine whether [Monitored Natural Attenuation] would fulfill all the objectives within a reasonable time frame. Monitored Natural Attenuation could be used in conjunction with one of the other alternatives.

The final portion of Mr. Tomchuk's presentation dealt with a review of the nine evaluation criteria for alternatives that are specified under the National Contingency Plan (NCP). Seven of these factors are addressed in the FS. The first two criteria are called "threshold factors" and the next five are called "primary balancing factors." The final two criteria, "modifying considerations," are state and community acceptance and cannot be looked at in the FS because until the FS is issued, those constituencies cannot comment on the recommended remedy. State acceptance comes with the release of the Proposed Plan, at which time the state can look at the draft alternative and comment. Community acceptance occurs after that, when the Proposed Plan is released to the public. At that time, public comment is taken and community acceptance is incorporated into the Record of Decision (ROD).

The FS is developed and used to produce the Feasibility Study Report. For this project, the FS Report will be issued in December of 2000, along with the Proposed Plan. The ROD is scheduled for June 2001.

Following are highlights of the question and answer period.

Question: Is the amount of time for this project - eight years at this point - typical for a Superfund project?

Response: The time frame for Superfund projects varies depending on a particular project's complexity. From the beginning, this project was viewed as more complex. This project is longer than most, but most projects do not need the type of complex modeling required to understand the fate and transport [of PCBs] in the system. Answering questions on fate and transport [lengthened] Phase 2 of the work.

Question: Will there be a document on the FS Scope of Work?

Response: Yes, it will be released shortly and is similar to the Human Health Risk Assessment Scope of Work (SOW). There will be a public comment period on that document extending to November 2, 1998. There will be an Availability Session on the two [documents] on Tuesday, October 20, at the Albany Marriott.

Question: Regarding the ecological risk assessment: 1) As to PCB concentrations in fish for the ecological risk assessment, will [EPA] be doing an independent evaluation different from the human health assessment, or using the same fish concentrations? Will you also be looking at congeners? 2) Will you do additional sampling and data gathering as part of the ecological risk assessment?

Response: 1) For human health risk assessment, EPA uses filet data, assuming that this is what is consumed. For ecological risk assessment, it is assumed that one fish eating another eats the whole fish, so EPA uses whole body data in this case. Congener-specific analysis will be done when appropriate. 2) No. EPA has all the data. We are at Step 6 to 7 in the process (Attachment 4). Description of sampling and data gathering during the presentation was to illustrate that [these are steps that are] part of the process. EPA will use 1993 EPA data, 1993 and 1995 DEC and NOAA data, and may consider additional DEC and GE data.

Question: How does checking the risk of other animals - birds and mammals - work?

Response: Those will be modeled. EPA may also use some tree swallow data from US Fish and Wildlife. From the fate and transport and bio-uptake models, EPA gets results of PCB body burdens in fish. From there, individual models may be used for each of the other species not addressed in the bio-uptake portion of the assessment.

Question: Re the SOW's including Albany/Troy area to the Battery in New York City, how will the agency distinguish other sources of PCBs in the salt water portion of the river and decide on appropriate remedies?

Response: The lower river is important because of significant habitats that would be assessed for surface water and sediment quality, but [might not] have specific risk assessments for each area. EPA will look at other areas, for example the NOAA National Estuary area, to see if there is a PCB impact there. It would be complicated to tie a direct risk back to an influence from upriver sources.

Question: When EPA says "critical habitat," whose definition is that? Are these habitats species-specific, such as migratory bird habitats?

Response: NYSDEC and NOAA have been working with EPA both to be sure certain areas (such as the National Estuary) are looked at and to suggest other areas for consideration. Ms. Ferreira will check as to specifics, but noted general considerations such as spawning areas, wetlands, etc.

Question: Will there be any parallels, comparisons, or "interchangeability" between the human health and ecological risk assessment built into the modeling that is used?

Response: What both human health and ecological risk assessments need is concentrations of fish at certain dates. EPA is determining PCB concentrations in certain species of fish in various levels of the food chain through fate and transport modeling and bio-uptake modeling. That information is used to project [concentrations] over a period of years and can be applied from that point to both human health and ecological risk assessment.

Question: Is EPA going to be looking at benthic and macro invertebrates? There apparently data sets available. Is the data that is available sufficient? To the extent that EPA relies on that data, how will EPA take into account, as an example, the presence of metals in the Thompson Island Pool, where there are twice the amount of lead than PCBs, and also significant amounts of cadmium? Are you going to take into account what is causing any effects you see in the benthic and macro invertebrates?

Response: With regard to studies and data sets that may be available, at this point EPA has not evaluated whether studies that might be available would be of a quality that could be used in the risk assessment. Metals were sampled during the ecological risk assessment, and are pertinent particularly with [benthic and macro invertebrate] community-type impacts and changes in community structure. Mr. Tomchuk is uncertain as to the extent of the analysis that will occur. EPA is not planning to collect any additional data; if additional data were available, it would be used to the extent possible.

Question: At the July 15 HROC meeting, there was discussion of meetings between EPA, GE, and the public. Has a date been set for this type of meeting on the Data Evaluation and Interpretation Report?

Response: Mr. Tomchuk clarified that the first forum that was suggested was a meeting on a report GE submitted to EPA pertaining to the Thompson Island Pool bias studies that EPA is still analyzing. Therefore no date has been set for that forum. In response to a follow-on as to whether this might take place before the end of the year, Mr. Tomchuk affirmed that this is EPA's intention.

Question: Based on the comments of the September 9 and 10 peer review committee on the modeling work program, is EPA reviewing and modifying the modeling approach that has been in place?

Response: EPA has not yet received the final report and is still determining what if any changes need to be made. EPA's plans will be documented and published after the final report from the peer review committee is released.

Question: In view of comments received regarding the low Resolution Coring Report both at the Scientific and Technical Committee meeting and from GE, is EPA rethinking its "premature and rash jump statement" regarding the need for immediate remedial action in the Thompson Island Pool?

Response: EPA is doing an assessment of whether an early action is warranted and will make a decision by year's end.

Question: Considerable discussion occurred around a request for a "short-term human health risk mitigation plan" as part of EPA's options for remediation, "having nothing to do with the river but more importantly human health risk associated with fish consumption along the river." The speaker expressed concern that nothing is being done about fish consumption along the river. He complained that there has been "no acknowledgment that there is a long-term human health risk through short-term non-action." His community is still eating the fish. He expressed concern over sustenance fishing up and down the river, and offered the opinion that NYS Department of Health and DEC do a "horrible job of reaching those people."

Response: Mr. Tomchuk urged the speaker to tell his community not to eat the fish. He stated that EPA is funding DEC with grant money for a fishing advisories program. He stated that other than public education approaches, he was uncertain as to what more can be done to prevent people from eating the fish from the Hudson, particularly women of child-bearing age and children under the age of 15.

Mr. Tomchuk explained that human health risk assessment generally addresses a longer-term type of toxicity and exposure. A short-term exposure might fall within acceptable levels [of toxicity]. Further, Mr. Tomchuk pointed out that EPA has to implement an action to remedy the situation, if that is what needs to be done. That can only happen after the FS is complete and the [remedial] decision is made. EPA cannot reduce the risk until then, except through fishing advisories.

Question: Could EPA clarify the difference between "assessment end points" and "receptors of concern?"

Response: Receptors of concern are the species affected by the contamination, and assessment end points are values that need to be protected. Receptors fit into the assessment end points. For example, one assessment end point is the [value for PCB] body burdens in fish, and the receptor(s) of concern would be the fish.

There being no further discussion, Ms. Rychlenski adjourned the meeting.

ATTACHMENT 1

Hudson River PCBs Reassessment
Community Interaction Program

Joint Liaison Group Meeting
Wednesday, September 23, 1998
7:30 p.m.
Holiday Inn Express
Latham, New York

AGENDA

Welcome & Introduction	Ann Rychlenski, Community Relations Coordinator, U.S. EPA
Presentation of Scope of Work for the hase 2 Ecological Risk Assessment	Gina Ferreira, Environmental Scientist, U.S. EPA
Presentation of Scope of Work for the Reassessment Feasibility Study	Doug Tomchuk, Remedial Project Manager, U.S. EPA

Questions & Answers

ATTACHMENT 2
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US ENVIRONMENTAL PROTECTION AGENCY
HUDSON RIVER PCBs REASSESSMENT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Community Interaction Program
Joint Liaison Group Meeting
Latham, NY
September 23, 1998

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HUDSON RIVER PCBs REASSESSMENT
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ATTACHMENT 2
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US ENVIRONMENTAL PROTECTION AGENCY
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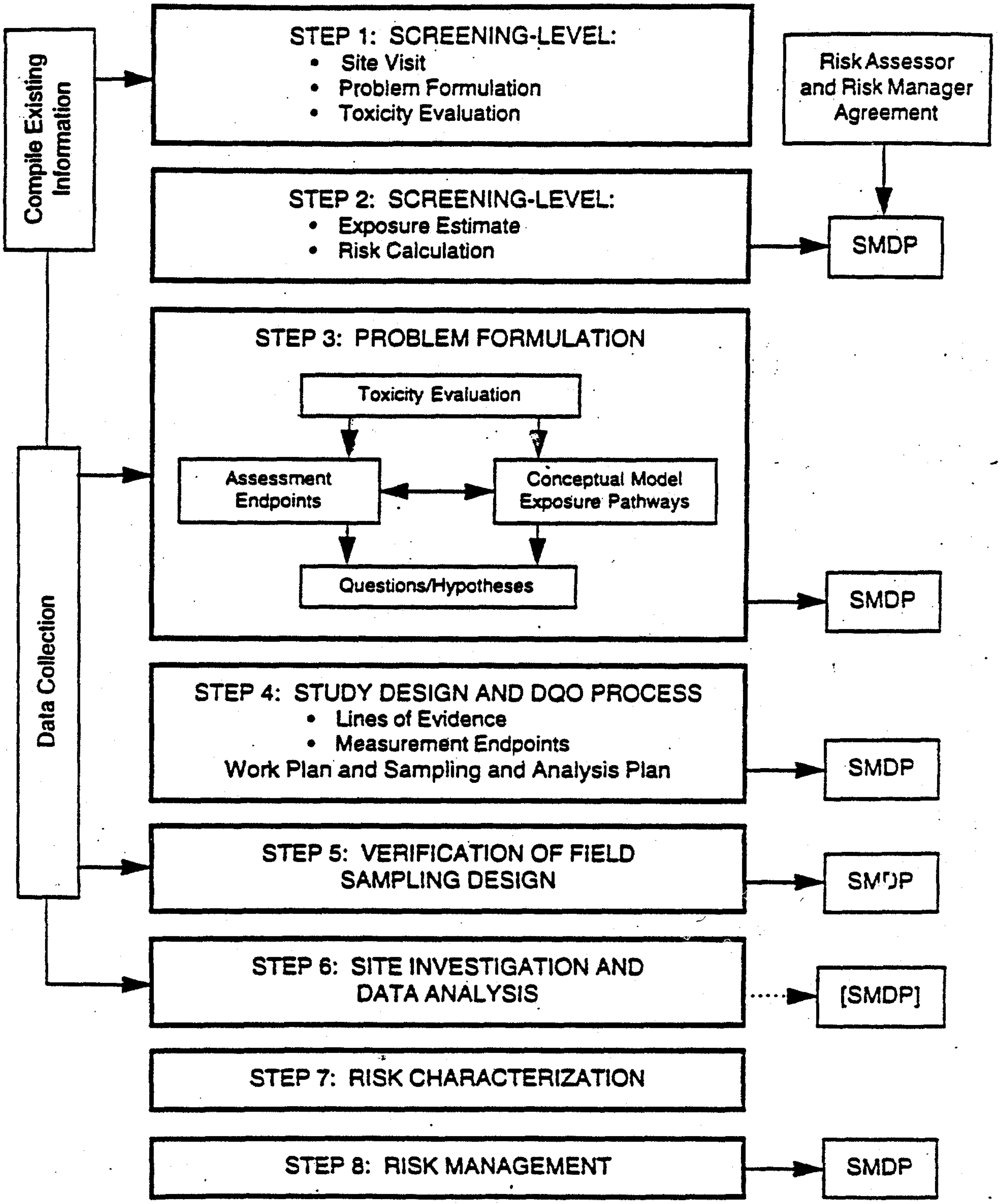
ATTACHMENT 3
1-6

EXHIBIT I-2
Eight-step Ecological Risk Assessment Process for Superfund



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ATTACHMENT 3
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GLOSSARY

This glossary includes definitions from several sources. A superscript number next to a word identifies the reference from which the definition was adapted (listed at the end of the Glossary).

Abiotic.[1] Characterized by absence of life; abiotic materials include non-living environmental media (e.g., water, soils, sediments); abiotic characteristics include such factors as light, temperature, pH, humidity, and other physical and chemical influences.

Absorption Efficiency. A measure of the proportion of a substance that a living organism absorbs across exchange boundaries (e.g., gastrointestinal tract).

Absorbed Dose.[2] The amount of a substance penetrating the exchange boundaries of an organism after contact. Absorbed dose for the inhalation and ingestion routes of exposure is calculated from the intake and the absorption efficiency. Absorbed dose for dermal contact depends on the surface area exposed and absorption efficiency.

Accuracy.[4] The degree to which a measurement reflects the true value of a variable.

Acute.[5] Having a sudden onset or lasting a short time. An acute stimulus is severe enough to induce a response rapidly. The word acute can be used to define either the exposure or the response to an exposure (effect). The duration of an acute aquatic toxicity test is generally 4 days or less and mortality is the response usually measured.

Acute Response. The response of (effect on) an organisms which has a rapid onset. A commonly measured rapid-onset response in toxicity tests is mortality.

Acute Tests. A toxicity test of short duration, typically 4 days or less (i.e., of short duration relative to the lifespan of the test organism).

Administered Dose.[2] The mass of a substance given to an organism and in contact with an exchange boundary (i.e., gastrointestinal tract) per unit wet body weight (BW) per unit time (e.g., mg/kgBW/day).

Adsorption.[14] Surface retention of molecules, atoms, or ions by a solid or liquid, as opposed to absorption, which is penetration of substances into the bulk of a solid or liquid.

Area Use Factor. The ratio of an organism's home range, breeding range, or feeding/foraging range to the area of contamination of the site under investigation.

Assessment Endpoint.[6] An explicit expression of the environmental value that is to be protected.

Benthic Community.[7] The community of organisms dwelling at the bottom of a pond, river, lake, or ocean.

Bioaccumulation.[5] General term describing a process by which chemicals are taken up by an organism either directly from exposure to a contaminated medium or by consumption of food containing the chemical.

Bioccumulation Factor (BAF).[3] The ratio of the concentration of a contaminant in an organism to the concentration in the ambient environment at steady state, where the organism can take in the contaminant through ingestion with its food as well as through direct contact.

Bioassay.[5] Test used to evaluate the relative potency of a chemical by comparing its effect on living organisms with the effect of a standard preparation on the same type of organism. Bioassay and toxicity tests are not the same—see toxicity test. Bioassays often are run on a series of dilutions of whole effluents.

Bioassessment. A general term referring to environmental evaluations involving living organisms; can include bioassays, community analyses, etc.

Bioavailability.[4] The degree to which a material in environmental media can be assimilated by an organism.

Bioconcentration.[5] A process by which there is a net accumulation of a chemical directly from an exposure medium into an organism.

Biodegrade.[1] Decompose into more elementary compounds by the action of living organisms, usually referring to microorganisms such as bacteria.

Biomagnification.[5] Result of the process of bioaccumulation and biotransfer by which tissue concentrations of chemicals in organisms at one trophic level exceed tissue concentrations in organisms at the next lower trophic level in a food chain.

Biomarker.[21] Biochemical, physiological, and histological changes in organisms that can be used to estimate either exposure to chemicals or the effects of exposure to chemicals.

Biomonitoring.[5] Use of living organisms as "sensors" in environmental quality surveillance to detect changes in environmental conditions that might threaten living organisms in the environment.

Body Burden. The concentration or total amount of a substance in a living organism; implies accumulation of a substance above background levels in exposed organisms.

Breeding Range. The area utilized by an organism during the reproductive phase of its life cycle and during the time that young are reared.

Bulk Sediment.[8] Field collected sediments used to conduct toxicity tests; can contain multiple contaminants and/or unknown concentrations of contaminants.

Characterization of Ecological Effects.[6] A portion of the analysis phase of ecological risk assessment that evaluates the ability of a stressor to cause adverse effects under a particular set of circumstances.

Characterization of Exposure.[6] A portion of the analysis phase of ecological risk assessment that evaluates the interaction of the stressor with one or more ecological components. Exposure can be expressed as co-occurrence, or contact depending on the stressor and ecological component involved.

Chemicals of Potential Concern.[2] Chemicals that are potentially site-related and whose data are of sufficient quality for use in a quantitative risk assessment.

Chronic.[5] Involving a stimulus that is lingering or continues for a long time; often signifies periods from several weeks to years, depending on the reproductive life cycle of the species. Can be used to define either the exposure or the response to an exposure (effect). Chronic exposures typically induce a biological response of relatively slow progress and long duration.

Chronic Response. The response of (or effect on) an organism to a chemical that is not immediately or directly lethal to the organism.

Chronic Tests.[9] A toxicity test used to study the effects of continuous, long-term exposure of a chemical or other potentially toxic material on an organism.

Community.[6] An assemblage of populations of different species within a specified location and time.

Complexation.[14] Formation of a group of compounds in which a part of the molecular bonding between compounds is of the coordinate type.

Concentration. The relative amount of a substance in an environmental medium, expressed by relative mass (e.g., mg/kg), volume (ml/L), or number of units (e.g., parts per million).

Concentration-Response Curve.[5] A curve describing the relationship between exposure concentration and percent of the test population responding.

Conceptual Model.[6] Describes a series of working hypotheses of how the stressor might affect ecological components. Describes ecosystem or ecosystem components potentially at risk, and the relationships between measurement and assessment endpoints and exposure scenarios.

Contaminant of (Ecological) Concern. A substance detected at a hazardous waste site that has the potential to affect ecological receptors adversely due to its concentration, distribution, and mode of toxicity.

Control.[5] A treatment in a toxicity test that duplicates all the conditions of the exposure treatments but contains no test material. The control is used to determine the response rate expected in the test organisms in the absence of the test material.

Coordinate Bond.[14] A chemical bond between two atoms in which a shared pair of electrons forms the bond and the pair of electrons has been supplied by one of the two atoms. Also known as a coordinate valence.

Correlation.[10] An estimate of the degree to which two sets of variables vary together, with no distinction between dependent and independent variables.

Critical Exposure Pathway. An exposure pathway which either provides the highest exposure levels or is the primary pathway of exposure to an identified receptor of concern.

Degradation.[14] Conversion of an organic compound to one containing a smaller number of carbon atoms.

Deposition.[14] The lying, placing, or throwing down of any material.

Depuration.[5] A process that results in elimination of toxic substances from an organism.

Depuration Rate. The rate at which a substance is depurated from an organism.

Dietary Accumulation.[9] The net accumulation of a substance by an organism as a result of ingestion in the diet.

Direct Effect (toxin).[6] An effect where the stressor itself acts directly on the ecological component of interest, not through other components of the ecosystem.

Dose.[11] A measure of exposure. Examples include (1) the amount of a chemical ingested, (2) the amount of a chemical absorbed, and (3) the product of ambient exposure concentration and the duration of exposure.

Dose-Response Curve.[5] Similar to concentration-response curve except that the dose (i.e. the quantity) of the chemical administered to the organism is known. The curve is plotted as Dose versus Response.

ATTACHMENT 4-6

Duplicate.[8] A sample taken from and representative of the same population as another sample. Both samples are carried through the steps of sampling, storage, and analysis in an identical manner.

Ecological Component.[6] Any part of an ecosystem, including individuals, populations, communities, and the ecosystem itself.

Ecological Risk Assessment.[6] The process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors.

Ecosystem.[6] The biotic community and abiotic environment within a specified location and time, including the chemical, physical, and biological relationships among the biotic and abiotic components.

Ecotoxicity.[11] The study of toxic effects on nonhuman organisms, populations, or communities.

Estimated or Expected Environmental Concentration.[5] The concentration of a material estimated as being likely to occur in environmental media to which organisms are exposed.

Exposure.[6] Co-occurrence of or contact between a stressor and an ecological component. The contact reaction between a chemical and a biological system, or organism.

Exposure Assessment.[2] The determination or estimation (qualitative or quantitative) of the magnitude, frequency, duration, and route of exposure.

Exposure Pathway.[2] The course a chemical or physical agent takes from a source to an exposed organism. Each exposure pathway incudes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, transport/exposure media (i.e., air, water) also are included.

Exposure Pathway Model. A model in which potential pathways of exposure are identified for the selected receptor species.

Exposure Point.[2] A location of potential contact between an organism and a chemical or physical agent.

Exposure Point Concentration. The concentration of a contaminant occurring at an exposure point.

Exposure Profile.[6] The product of characterizing exposure in the analysis phase of ecological risk assessment. The exposure profile summarizes the magnitude and spatial and temporal patterns of exposure for the scenarios described in the conceptual model.

Exposure Route.[2] The way a chemical or physical agent comes in contact with an organism (i.e., by ingestion, inhalation, or dermal contact).

Exposure Scenario.[6] A set of assumptions concerning how an exposure takes place, including assumptions about the exposure setting, stressor characteristics, and activities of an organism that can lead to exposure.

False Negative. The conclusion that an event (e.g., response to a chemical) is negative when it is in fact positive (see Appendix D).

False Positive. The conclusion that an event is positive when it is in fact negative (see Appendix D).

Fate.[5] Disposition of a material in various environmental compartments (e.g. soil or sediment, water, air, biota) as a result of transport, transformation, and degradation.

Food-Chain Transfer. A process by which substances in the tissues of lower-trophic-level organisms are transferred to the higher-trophic-level organisms that feed on them.

Forage (feeding) Area. The area utilized by an organism for hunting or gathering food.

Habitat.[1] Place where a plant or animal lives, often characterized by a dominant plant form and physical characteristics.

Hazard. The likelihood that a substance will cause an injury or adverse effect under specified conditions.

Hazard Identification.[2] The process of determining whether exposure to a stressor can cause an increase in the incidence of a particular adverse effect, and whether an adverse effect is likely to occur.

Hazard Index.[3] The sum of more than one hazard quotient for multiple substances and/or multiple exposure pathways. The HI is calculated separately for chronic, subchronic, and shorter-duration exposures.

Hazard Quotient.[2] The ratio of an exposure level to a substance to a toxicity value selected for the risk assessment for that substance (e.g., LOAEL or NOAEL).

Home Range.[12] The area to which an animal confines its activities.

Hydrophilic.[22] Denoting the property of attracting or associating with water molecules; characteristic of polar or charged molecules.

ATTACHMENT 3
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Hydrophobic.[12] With regard to a molecule or side group, tending to dissolve readily in organic solvents, but not in water, resisting wetting, not containing polar groups or subgroups.

Hypothesis.[12] A proposition set forth as an explanation for a specified phenomenon or group of phenomena.

Indirect Effect.[6] An effect where the stressor acts on supporting components of the ecosystem, which in turn have an effect on the ecological component of interest.

Ingestion Rate. The rate at which an organism consumes food, water, or other materials (e.g., soil, sediment). Ingestion rate usually is expressed in terms of unit of mass or volume per unit of time (e.g., kg/day, L/day).

Ionization.[14] The process by which a neutral atom loses or gains electrons, thereby acquiring a net charge and becoming an ion.

Lethal.[5] Causing death by direct action.

Lipid.[13] One of a variety of organic substances that are insoluble in polar solvents, such as water, but that dissolve readily in non-polar organic solvents. Includes fats, oils, waxes, steroids, phospholipids, and carotenes.

Lowest-Observable-Adverse-Effect Level (LOAEL). The lowest level of a stressor evaluated in a toxicity test or biological field survey that has a statistically significant adverse effect on the exposed organisms compared with unexposed organisms in a control or reference site.

Matrix.[14] The substance in which an analyte is embedded or contained; the properties of a matrix depend on its constituents and form.

Measurement Endpoint.[6] A measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint. Measurement endpoints often are expressed as the statistical or arithmetic summaries of the observations that make up the measurement. As used in this guidance document, measurement endpoints can include measures of effect and measures of exposure, which is a departure from U.S. EPA's (1992a) definition which includes only measures of effect.

Media.[15] Specific environmental compartments—air, water, soil—which are the subject of regulatory concern and activities.

Median Effective Concentration (EC_{50}).[5] The concentration of a substance to which test organisms are exposed that is estimated to be effective in producing some sublethal response in 50 percent of the test population. The EC_{50} usually is expressed as a time-dependent value (e.g., 24-hour EC_{50}). The sublethal response elicited from the test organisms as a result of exposure must be clearly defined.

Median Lethal Concentration (LC_{50}).[5] A statistically or graphically estimated concentration that is expected to be lethal to 50 percent of a group of organisms under specified conditions.

Metric.[16] Relating to measurement; a type of measurement—for example a measurement of one of various components of community structure (e.g., species richness, % similarity).

Mortality. Death rate or proportion of deaths in a population.

No-Observed-Adverse-Effect Level (NOAEL).[5] The highest level of a stressor evaluated in a toxicity test or biological field survey that causes no statistically significant difference in effect compared with the controls or a reference site.

Nonparametric.[17] Statistical methods that make no assumptions regarding the distribution of the data.

Parameter.[18] Constants applied to a model that are obtained by theoretical calculation or measurements taken at another time and/or place, and are assumed to be appropriate for the place and time being studied.

Parametric.[14] Statistical methods used when the distribution of the data is known.

Population.[6] An aggregate of individuals of a species within a specified location in space and time.

Power.[10] The power of a statistical test indicates the probability of rejecting the null hypothesis when it should be rejected (i.e., the null hypothesis is false). Can be considered the sensitivity of a statistical test. (See also Appendix D.)

Precipitation.[14] In analytic chemistry, the process of producing a separable solid phase within a liquid medium.

Precision.[19] A measure of the closeness of agreement among individual measurements.

Reference Site.[11] A relatively uncontaminated site used for comparison to contaminated sites in environmental monitoring studies, often incorrectly referred to as a control.

Regression Analysis.[10] Analysis of the functional relationship between two variables; the independent variable is described on the X axis and the dependent variable is described on the Y axis (i.e, the change in Y is a function of a change in X).

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Replicate. Duplicate analysis of an individual sample. Replicate analyses are used for quality control.

Representative Samples.[18] Serving as a typical or characteristic sample; should provide analytical results that correspond with actual environmental quality or the condition experienced by the contaminant receptor.

Risk.[5] The expected frequency or probability of undesirable effects resulting from exposure to known or expected stressors.

Risk Characterization.[6] A phase of ecological risk assessment that integrates the results of the exposure and ecological effects analyses to evaluate the likelihood of adverse ecological effects associated with exposure to the stressor. The ecological significance of the adverse effects is discussed, including consideration of the types and magnitudes of the effects, their spatial and temporal patterns, and the likelihood of recovery.

Sample.[14] Fraction of a material tested or analyzed; a selection or collection from a larger collection.

Scientific/Management Decision Point (SMDP). A point during the risk assessment process when the risk assessor communicates results of the assessment at that stage to a risk manager. At this point the risk manager determines whether the information is sufficient to arrive at a decision regarding risk management strategies and/or the need for additional information to characterize risk.

Sediment.[20] Particulate material lying below water.

Sensitivity. In relation to toxic substances, organisms that are more sensitive exhibit adverse (toxic) effects at lower exposure levels than organisms that are less sensitive.

Sensitive Life Stage. The life stage (i.e., juvenile, adult, etc.) that exhibits the highest degree of sensitivity (i.e., effects are evident at a lower exposure concentration) to a contaminant in toxicity tests.

Species.[13] A group of organisms that actually or potentially interbreed and are reproductively isolated from all other such groups; a taxonomic grouping of morphologically similar individuals; the category below genus.

Statistic.[10] A computed or estimated statistical quantity such as the mean, the standard deviation, or the correlation coefficient.

Stressor.[6] Any physical, chemical, or biological entity that can induce an adverse response.

Sublethal.[5] Below the concentration that directly causes death. Exposure to sublethal concentrations of a substance can produce less obvious effects on behavior, biochemical and/or physiological functions, and the structure of cells and tissues in organisms.

Threshold Concentration.[5] A concentration above which some effect (or response) will be produced and below which it will not.

Toxic Mechanism of Action.[23] The mechanism by which chemicals produce their toxic effects, i.e., the mechanism by which a chemical alters normal cellular biochemistry and physiology. Mechanisms can include; interference with normal receptor-ligand interactions, interference with membranae functions, interference with cellular energy production, and binding to biomolecules.

Toxicity Assessment. Review of literature, results in toxicity tests, and data from field surveys regarding the toxicity of any given material to an appropriate receptor.

Toxicity Test.[5] The means by which the toxicity of a chemical or other test material is determined. A toxicity test is used to measure the degree of response produced by exposure to a specific level of stimulus (or concentration of chemical) compared with an unexposed control.

Toxicity Value.[2] A numerical expression of a substance's exposure-response relationship that is used in risk assessments.

Toxicant. A poisonous substance.

Trophic Level.[6] A functional classification of taxa within a community that is based on feeding relationships (e.g., aquatic and terrestrial plants make up the first trophic level, and herbivores make up the second).

Type I Error.[10] Rejection of a true null hypothesis (see also Appendix D).

Type II Error.[10] Acceptance of a false null hypothesis (see also Appendix D).

Uptake.[5] A process by which materials are transferred into or onto an organism.

Uncertainty.[11] Imperfect knowledge concerning the present or future state of the system under consideration; a component of risk resulting from imperfect knowledge of the degree of hazard or of its spatial and temporal distribution.

Volatilization.[14] The conversion of a chemical substance from a liquid or solid state to a gaseous vapor state.

Hudson River

Ecological Risk Assessment Scope of Work

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ATTACHMENT 4
1-9

Ecological Risk Assessment Scope of Work

- Superfund requirement of the RI/FS process.
- Used by EPA decision makers in remedy selection.
- **Areas of Concern in the Hudson River:**
  - ✓ **Upper Hudson River Assessment: Hudson Falls to Albany/Troy.**
  - ✓ **Thompson Island Pool.**
  - ✓ **Lower Hudson River Assessment: Albany/Troy to the Battery in New York City.**

ERA Definition and Functions

- **Definition** - *the process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to contaminants.*

- **Functions of an ERA:**
  - ✓ **Document whether actual or potential risks exist.**
  - ✓ **Identify which contaminants pose an ecological risk.**
  - ✓ **Generate data to be used in evaluating remedial options.**

ATTACHMENT 4
2-9

ERA Process

- Superfund ERAs are prepared according to the guidelines within the "***Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments.***"
- This process involves an 8 step systematic approach that starts at Initial Screening and follows through to Risk Management.

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Steps 1 and 2 - Initial Screening

- These steps were completed as part of the Phase I Report.
- Screening steps concluded that PCB concentrations in surface water, sediment, and biota exceeded federal and state guidelines.
- It was determined that the potential for adverse impacts exists, and a more thorough assessment was necessary.

ATTACHMENT 3-9

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Step 3 - Problem Formulation

- Defines the specific objectives, scope, and rationale of the assessment.
- **Problem formulation identifies:**
  - ✓ **potential contaminants of concern & exposure pathways;**
  - ✓ **assessment endpoints;**
  - ✓ **known ecological effects; and**
  - ✓ **ecological receptors of concern.**

Contaminants of Concern/ Exposure Pathways

- PCBs are the Contaminants of Concern for this ERA.
- **Exposure Pathways:** how receptors come into contact with the COCs.
  - ✓ **(example - ingestion of sediment, bioaccumulation through the food chain, etc).**

ATTACHMENT 4-9

Assessment Endpoints

- **Definition** - *an explicit expression of the environmental value that is to be protected.*
- **Assessment Endpoints** focus the ERA on the particular components of the ecosystem that could adversely be affected by the COCs from the site, & are selected based on:
  - ✓ **COCs present;**
  - ✓ **mechanisms of toxicity;**
  - ✓ **ecologically relevant receptor groups that are sensitive or highly exposed to the COC; and**
  - ✓ **potentially complete exposure pathways.**

Assessment Endpoints *(continued)*

- **Assessment Endpoints selected for the Hudson River ERA are:**
  - ✓ benthic community structure as a food source for fish and wildlife;
  - ✓ survival, growth, and reproduction of local fish populations;
  - ✓ protection of local wildlife (birds & mammals);
  - ✓ protection of endangered and threatened species; and
  - ✓ protection of significant habitats.

ATTACHMENT 4
5-9

Known Ecological Effects

- PCBs are generally chronically toxic.
- Individual congeners have been shown to induce mortality and produce reproductive, developmental, and neurological effects.
- Toxicity Reference Values (TRVs) represent PCB concentrations that have been shown to cause adverse effects in test species.
- **PCBs wil be examined as:**
  - ✓ **Congener-specific PCBs;**
  - ✓ **Total PCBs; and**
  - ✓ **oclors.**

Ecological Receptors of Concern

- Represent wildlife species that could potentially be affected by PCBs in the Hudson River.
- The receptors were chosen to represent different trophic levels, a variety of feeding types, and several habitats.
- **Receptors include:**
  - ✓ **macroinvertebrate communities;**
  - ✓ **fish;**
  - ✓ **birds; and**
  - ✓ **mammals.**

ATTACHMENT 4
6-9

Step 4 - Study Design & Data Quality Objectives Process

- The selection of measurement endpoints.
- **Definition:** *a measurable ecological characteristic that is related to the assessment endpoints selected.*
- **Measurement Endpoints include:**
  - ✓ **benthic community indices;**
  - ✓ **PCB body burdens in fish for use in evaluating exposure via the food chain;**
  - ✓ **PCB body burdens in fish and wildlife to determine exceedances of population-level effect thresholds; and**
  - ✓ **PCB concentrations in sediment and surface water as compared to applicable water quality criteria for the protection of fish and wildlife.**

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Step 4 - Study Design & Data Quality Objectives Process *(continued)*

- The DQO process ensures that the type, quantity, and quality of the environmental data to be collected are adequate to support the intended purpose.

- **Specific goals of the DQO process are:**
  - ✓ **To clarify the study objectives & define the most appropriate types of data to collect; and**
  - ✓ **To determine the most appropriate field conditions under which to collect the data.**

ATTACHMENT 7-9

Step 5 - Verification of Field Sampling Design

- The primary purpose of field verification of the sampling plan is to ensure that the samples specified by the **Sampling and Analysis Plan** (SAP) can actually be collected.
- If changes to the SAP are necessary based on field conditions, they must be discussed and agreed upon.

Step 6 - Site Investigation and Data Analysis

- The **site investigation** is the direct implementation of the SAP.
- The **analysis phase** consists of technical evaluation of data on existing & potential exposures and ecological effects.
- In the analysis phase, the site-specific data obtained during the site investigation replace many of the assumptions made in the initial screening steps **(Steps 1& 2)**.

Step 7 - Risk Characterization

- Risk characterization integrates the results of the exposure and effects assessment to obtain an estimate of the level of effects that will result from exposure of the receptors to the PCBs in the Hudson River.

- Use "**weight of evidence**" approach:
  - ✓ **field observations;**
  - ✓ **comparison of measured and modeled exposure of biota to appropriate toxicity reference values; and**
  - ✓ **qualitative assessments of community structure and abundance.**

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Step 8- Risk Management

- Risk management is the responsibility of the site risk manager.
- It involves the need to balance risk reductions associated with potential remediation with the potential impacts of the actions themselves.