GEORGIA ENVIRONMENTAL PROTECTION DIVISION
GUIDANCE FOR SELECTING
MEDIA REMEDIATION LEVELS AT
RCRA SOLID WASTE MANAGEMENT UNITS

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GLOSSARY OF ACRONYMS

ACL	Alternate Concentration Limits
AD	Alternate Delineation
CAP	Corrective Action Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemicals of Concern
COPC	Chemicals of Potential Concern
EPD	Environmental Protection Division
ERA	Ecological Risk Assessment
FR	Federal Register
GGS	Georgia Geologic Survey
GHWMA	Georgia Hazardous Waste Management Act
HI	Hazard Index
HQ	Hazard Quotient
HSI	Hazardous Site Inventory
HSRA	Georgia Hazardous Site Response Act
K_{oc}	Organic Carbon Partition Coefficient
LOAEL	Lowest Observed Adverse Effect Level
MCL	Maximum Contaminant Levels
OSWER	Office of Solid Waste and Emergency Response
PRE	Preliminary Risk Evaluation
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfD	Reference Dose
RFI	RCRA Facility Investigation
RGO	Remedial Goal Options
SWMU	Solid Waste Management Unit
TRV	Toxicity Reference Value
USEPA	United States Environmental Protection Agency

GEORGIA EPD GUIDANCE FOR SELECTING MEDIA REMEDIATION LEVELS AT RCRA SWMUs

I. INTRODUCTION

The Georgia Hazardous Waste Management Act (GHWMA) requires the Georgia Environmental Protection Division (EPD) to issue permits to facilities that treat, store, or dispose of hazardous waste; this is part of the Federally authorized RCRA regulatory program. Permits issued after November 8, 1984 must include requirements for corrective action for releases of hazardous wastes or hazardous constituents from any solid waste management unit (SWMU) at the facility (these requirements may extend beyond the facility for releases which originate at the facility); permits issued before November 8, 1984 may be modified to include such requirements. The permit, once issued, generally includes a schedule for compliance and a demonstration of financial assurance to complete the corrective action. Interim status facilities, while not permitted, are also subject to corrective action through other legal instruments (e.g., an order).

EPD's primary mandate is to protect human health and the environment. In the past, EPD met this goal by requiring corrective actions at RCRA facilities to remediate environmental media (i.e., air, water, and soil) to background levels. In the case of groundwater, maximum contaminant levels (MCLs) were used as remediation levels.[1]

An alternative to this "background" strategy that, in recent years, has gained substantial support is to set remediation levels based on an assessment of risk to human health and the environment. This approach first assesses the hazards and dose-response relationships associated with environmental contaminants, identifies exposures to these chemicals (for both present and reasonably anticipated future facility uses), and characterizes associated risks (this process is commonly referred to as a “risk assessment”). If it is determined during the risk assessment phase that a release poses an unacceptable risk, appropriate remediation levels are then generated. These remediation levels are based, in part, on information gathered during the risk assessment (e.g., exposure parameters). Specifically, chemical specific remediation levels are generated by solving the risk assessment algorithms for the concentration term and running the calculations at predetermined levels of risk or hazard. This kind of risk-based approach for selecting remediation levels is the current foundation of the Federal CERCLA remedial process.[2]

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[1]The EPD Director may establish "Alternate Concentration Limits" (ACLs) for certain constituents under the groundwater monitoring requirements for regulated units (see 40 CFR 264.94). While this may be related to the subject of corrective action at SWMUs, it is not dealt with in this guidance document.

[2]The EPD administers the requirements of the Georgia Hazardous Site Response Act (HSRA) and its implementing regulations at sites listed on the state's Hazardous Site Inventory (HSI; commonly referred to as the "State Superfund list"). While the HSRA Program has some commonalities with the Federal CERCLA process (including reliance on certain risk-based methodologies), the requirements of HSRA are not applicable for use at RCRA SWMUs. USEPA has concluded and has informed EPD that the promulgated HSRA clean-up standards and processes are not consistent with proposed RCRA Subpart S rules regarding corrective action.

To be protective of human health, the U.S. Environmental Protection Agency (USEPA) has stated that remediation levels for carcinogens must have estimated risks that are equal to or below an excess lifetime cancer risk level of 1 in 10,000 (1×10^{-4}). Under the CERCLA remedial process, remediation levels for carcinogens are usually selected to be within the 1×10^{-4} to 1×10^{-6} risk range, with alternatives at the more protective end of the range preferred.[3] For non-carcinogens, remediation levels are usually set at a level at which adverse effects would not be expected to occur. Specifically, chemical specific remediation levels are normally selected to be within a hazard quotient range of 0.1 to 3, with hazard quotients less than or equal to 1 preferred.

On July 27, 1990, USEPA published a proposed rule (55 FR 30798) that provides the framework for corrective action for SWMUs at facilities seeking or possessing a permit under section 3005(c) of RCRA (an update on the corrective action program for SWMUs was published on May 1, 1996 at 61 FR 19432). The proposal would create a new Subpart S and would define requirements for conducting remedial investigations, evaluating potential remedies, and selecting and implementing remedies at RCRA facilities. Similar to the CERCLA process for identifying clean-up levels for Federal Superfund sites, remedy selection under proposed Subpart S is based on an evaluation of the risk posed by releases from SWMUs to both human health and the environment (in some cases, an ecological risk assessment will be necessary).

EPD has evaluated the Subpart S proposed rule in light of the current remedial framework and agrees with the concept of basing remedy selection for SWMUs on an assessment of risks posed by releases of hazardous wastes or constituents. Use of a risk-based approach will allow facilities to implement remedies that are protective of human health and the environment. While EPD generally agrees with and draws on certain aspects of the proposed Subpart S rule in this guidance document, the proposed rule is not applicable per se until such time as it is finalized by USEPA and, if necessary for Georgia to maintain its primacy, subsequently adopted by the Georgia Board of Natural Resources.

In order to comport with these general criteria, the facility will prepare risk assessment documentation and proposed remediation levels according to this guidance and the methodologies outlined in the documents identified in Section IV below. This guidance document takes precedence over the USEPA Region IV guidance which, in turn, takes precedence over USEPA's *Risk Assessment Guidance for Superfund* (RAGS). If there is a conflict between this guidance manual and the referenced risk assessment methodologies, the plain language of this document prevails. This is necessary because there may be differences of philosophy, logic, intent, principle, language, or other characterizations made in the references which are inconsistent with the specific intent of this manual.

Protection of Georgia's environment is of significant importance to EPD. As such, there may be instances where a calculated remediation level for a particular chemical is protective of human receptors, but not protective of ecological receptors. In such cases, the remedial level that is protective of ecological receptors will normally prevail.

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[3] See 40 CFR 300.430(e)(2)(i)(A)(2).

The remainder of this document provides general guidance on EPD's approach to risk-based remedy selection for releases from SWMUs at RCRA facilities.

II. IDENTIFICATION OF RELEASES SUBJECT TO CORRECTIVE ACTION

The RCRA corrective action process for SWMUs consists of the following three phases:

1. The RCRA Facility Assessment (RFA) is conducted to identify releases or potential releases requiring further investigation.

   During the RFA, EPD investigators compile information on SWMUs at the facility. Sources of information may include, but are not limited to, inspection reports, permit applications, historical monitoring data, interviews, aerial photographs, a visual facility inspection, a SWMU questionnaire completed by the facility, and notification by the facility that a previously unknown SWMU(s) has been discovered.

2. The RCRA Facility Investigation (RFI) is conducted to characterize the nature and extent of releases, perform an assessment of risk posed by the releases, and identify potential media remediation levels.

   During the RFI phase, the facility submits an RFI workplan to EPD for those releases identified in the RFA. The workplan (which is implemented by the facility) includes a schedule of implementation and a description of the specific actions necessary to determine the nature and extent of releases from SWMUs identified by the RFA. The RFI workplan specifies the procedures that will be used to perform any planned risk assessment activities (both human and ecological) as well as the procedures that will be used for development of proposed remediation levels.[4] The RFI workplan must be reviewed and approved by EPD. Once approved, the facility conducts the work.

   The facility presents its findings (including the results of the risk assessment activities, proposed remediation levels, and justification for those levels) in an RFI report. The risk assessment activities and calculation of risk based remediation levels will be included in the RFI report as two separate sections; namely, one section for human receptors and one section for ecological receptors. (As in the past, the facility has the option of remediating to background values rather than performing a risk assessment, depending on facility-specific circumstances.[5])

[4]Facilities are encouraged to discuss facility-specific risk assessment requirements with EPD staff during the formulation of the RFI workplan.

[5]In some cases, remediation to background may be the most pragmatic, timely, and cost efficient solution for a specific area of contamination and continues to be an option.

In determining the nature and extent of a release, EPD will require delineation of contamination to background levels unless strongly supported justification can be presented for a facility specific alternate delineation (AD). In no event will risk-based delineation or modeling approaches be considered acceptable justification for an AD. The AD must be approved by EPD prior to commencing RFI work that begins after November 4, 1996. Examples of factors to be considered that demonstrate an AD is satisfactory to EPD are found in Appendix A.

3. Based on the findings of the RFI report, a Corrective Action Plan (CAP) is prepared by the facility that lays out the details of the selected corrective actions and a schedule of implementation.

Once the nature and extent of contamination are known, the facility will develop a proposed CAP for review by EPD. EPD will identify the SWMUs that must be considered under the CAP and will identify media remediation levels based on the information provided in the RFI report.[6]

III. GENERAL REQUIREMENTS FOR DETERMINATION OF RISK-BASED REMEDIATION LEVELS

If a facility relies on risk assessment procedures to determine media remediation levels, the following general principles will apply and are described in detail in the documents cited at the end of this guidance:

1. Assessment of Risk to Human Receptors

a. **COPCs** - The facility will develop a list of chemicals of potential concern (COPCs) for each affected medium (this will require a determination of background levels for naturally occurring inorganics). The COPCs are the chemicals that will be carried through the risk assessment process. The risk assessment will address all relevant exposure pathways under current and reasonably anticipated future use scenarios.[7]

b. **COCs** - The results of the risk characterization will be reviewed and a list of Chemicals of Concern (COCs) will be developed if the risks or hazards exceed certain trigger levels (see below). COCs are the COPCs that significantly contribute to a pathway in a use scenario for a receptor that either exceed a cumulative cancer risk of 1×10^{-6} or a non-carcinogenic hazard index (HI) of 1. Chemicals are not considered as significant contributors to risk and therefore are not included as COCs if their individual carcinogenic risk contribution is less than 1×10^{-6} and their non-

[6]The CAP is required to be submitted as a permit modification request in accordance with 40 CFR 270.41 ad 270.42.

[7]Reasonably anticipated future land use shall be established according to the procedures outlined in OSWER Directive Number 9355.7-04, "Land Use in the CERCLA Remedy Selection Process," USEPA, May 25, 1995.

carcinogenic Hazard Quotient (HQ) is less than 0.1. The COCs are the chemicals for which remediation levels are determined.

The 1×10^{-6} cumulative risk level and the HI of 1 are used as the remediation "triggers." The carcinogen "trigger" represents the summed risks to a receptor of all COPC's for all pathways per land use scenario. The HI represents the total of the HQs of all COPCs for all pathways per land use scenario.[8]

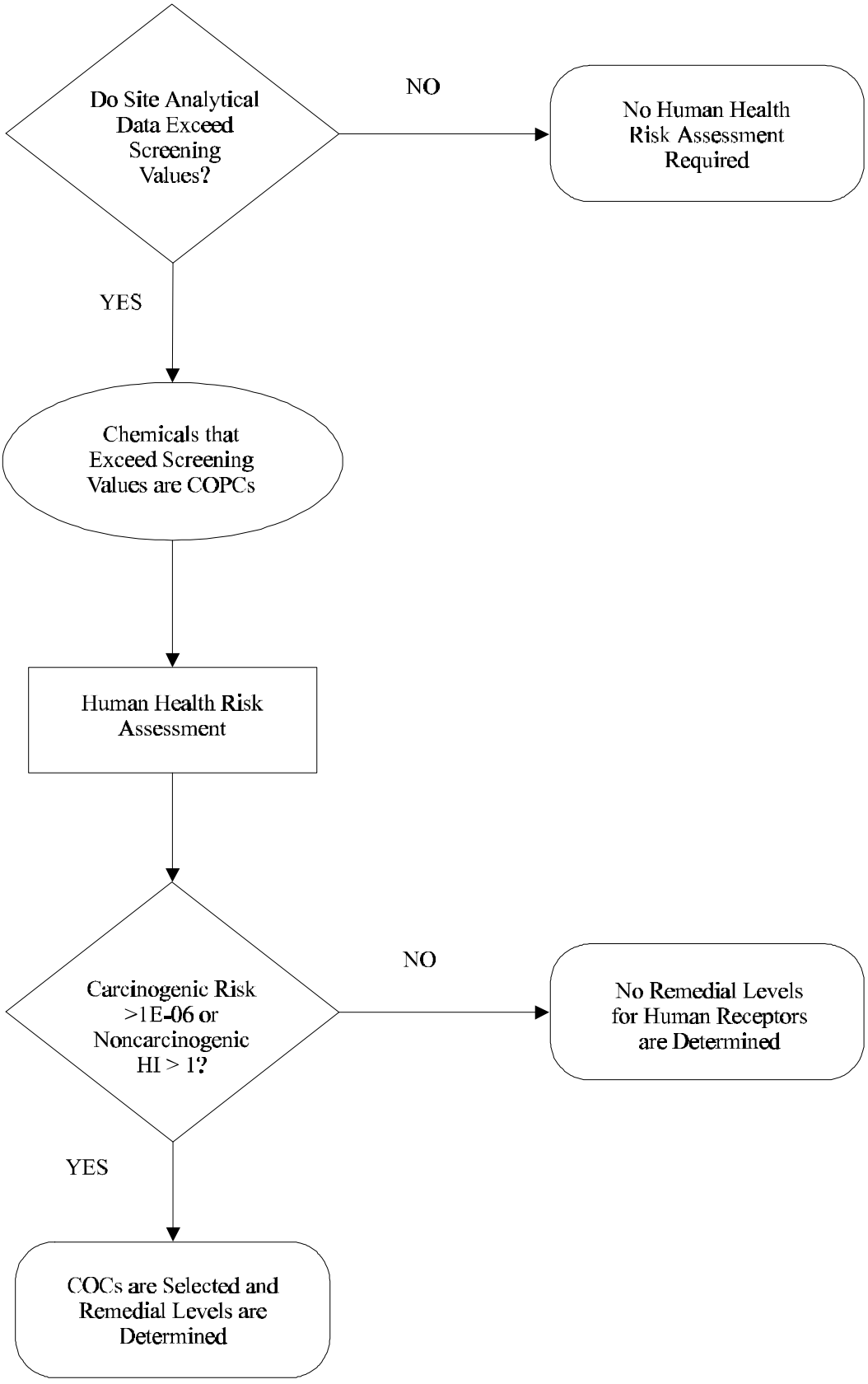
c. Remediation Levels for Protection of Human Health- The facility reviews the results of the baseline risk assessment and proposes a remediation level for protection of human health for each COC in each affected medium. These proposed remediation levels and justification for their selection are presented in the RFI report. EPD's preference for calculating proposed remediation levels is at a risk level of 1×10^{-6} for carcinogens and a hazard quotient of 1 for non-carcinogens. In no event shall a facility propose a remediation level that exceeds a risk level of 1×10^{-4} for carcinogens or a hazard quotient of 3 for non-carcinogens.

Note that EPD is not requiring the presentation of "Remedial Goal Options" (RGOs) as outlined in the USEPA Region IV guidance. Rather, the facility calculates remedial levels at a proposed level of risk or hazard for each COC in each medium in each land use scenario evaluated in the baseline risk assessment. The facility must provide justification for the proposed values thus calculated.

A flowchart for assessing risk/hazard to human health and selecting remediation levels for protection of human health follows:

[8] If the HI exceeds 1.0, then more specific HIs should be developed by summing HQs of COPCs with Reference Doses (RfDs) based on toxic effects on the same target organs. This specific target-organ based HI should form the basis of COC selection. EPD must be consulted if this situation arises.

General Process for Assessing Risk and Selecting Remedial Levels for Human Receptors



2. Assessment of Risk To Ecological Receptors

Exposure threats to ecological receptors must be assessed. Specifically, the RFI workplan shall identify the procedures necessary to perform the following activities (the Region IV document cited below provides more information on performing ecological risk assessments):

a. Preliminary Risk Evaluation (PRE)- The PRE is the initial ecological risk screening assessment at a RCRA facility. The primary purpose of the PRE is to compare concentrations of facility related contaminants with USEPA Region 4 ecological screening values. It is also used to develop an exposure scenario and risk characterization for a model ecological receptor based on contaminants which exceed screening values.

The PRE consists of five steps:

i. Ecological screening value comparison,
ii. Preliminary problem formulation,
iii. Preliminary ecological effects evaluation,
iv. Preliminary exposure estimate, and
v. Preliminary risk calculation.

The facility shall compare available analytical data with USEPA Region IV screening values (Step i) and, if any are exceeded, Steps ii-v shall be conducted. (Values for chemicals that lack Region IV screening values should be proposed and submitted to EPD for approval. Such values should be based on ecotoxicological information from sources such as scientific literature, computer databases, etc.) The chemicals that exceed screening values are, for purposes of the entire ecological evaluation, the COPCs.

The end result of the PRE is a characterization of risk based on the hazard quotient (HQ) method. The HQ method compares the estimated exposure level or daily dose to literature derived Toxicity Reference Values (TRVs) for each contaminant that exceeds a screening value. When more than one contaminant is involved in the risk calculation, the facility must sum the HQs if the compounds exhibit consistent modes of toxicity and effect endpoints (i.e., sum the HQs to produce an HI).

b. Ecological Risk Assessment- The Facility shall perform an Ecological Risk Assessment (ERA) if the preliminary risk calculation determined during the PRE exceeds an HQ or HI of 1.[9] EPD shall be consulted on the selection of appropriate

[9]Some TRVs are based on a Lowest Observed Adverse Effect Level (LOAEL) divided by a safety factor of 10. If a LOAEL/10 is the only TRV available for the risk calculation, a resultant HI or HQ near to but less than 1.0 may be indicative of potential ecological impacts to the receptor species. In this case, further refinement of the assumptions used in the effects and exposure analyses are required to determine whether to continue the ERA. EPD must be

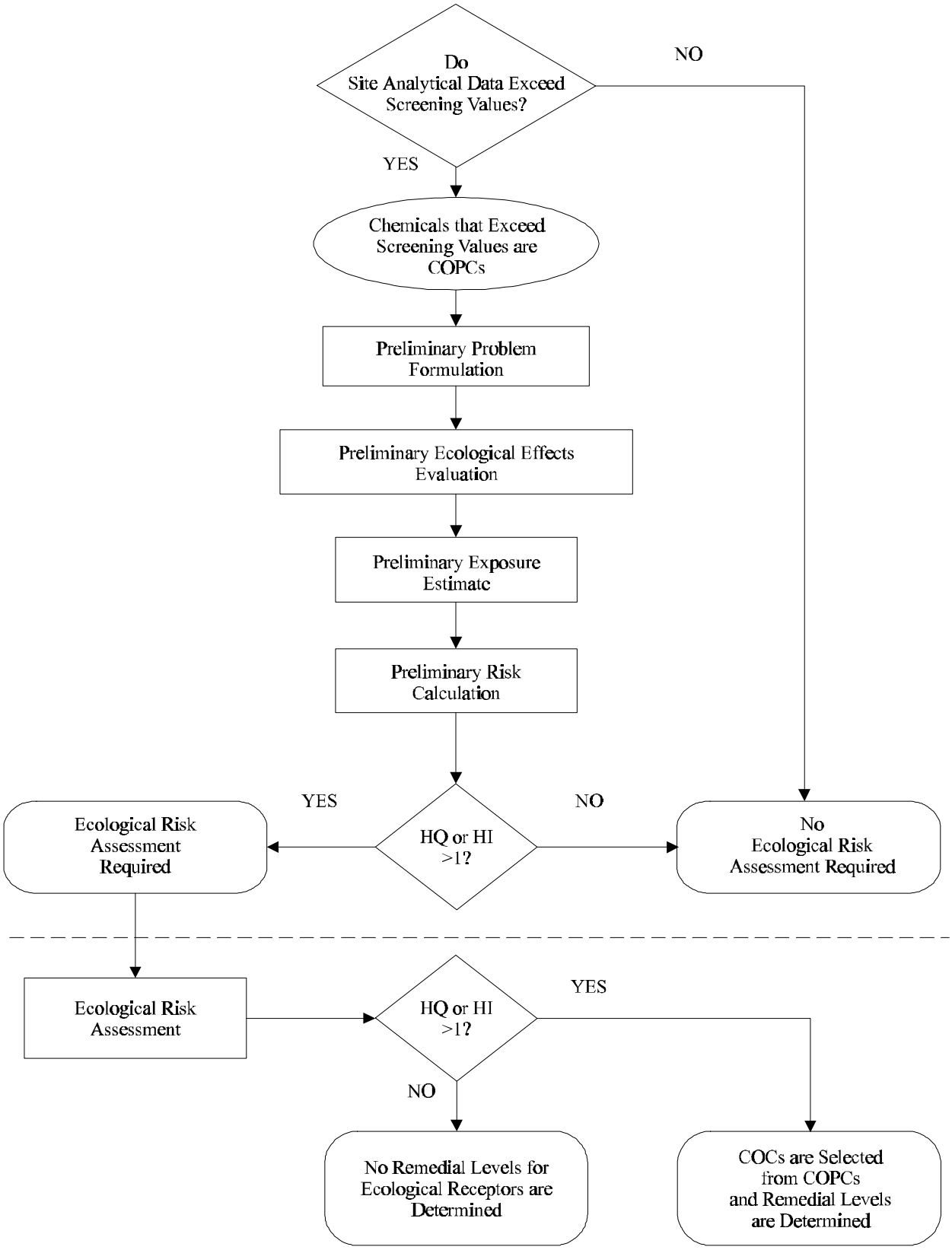
assessment and measurement endpoints. The end result of the ERA is a characterization of risk (again, based on the HQ method) but using site specific data. If the results of the ERA indicate that an HQ or HI exceeds 1, the facility shall develop a proposed remedial level for each COPC in each medium for each receptor evaluated in the ERA that exceeds a HQ of 1 (if an HI exceeds 1, remedial levels will be developed for the constituents that contribute significantly to the HI; EPD shall be consulted if this situation arises). The chemicals for which remedial levels are developed are the COCs.

c. Remediation Levels for Protection of Ecological Receptors - As with the human health process described above, proposed remedial levels for protection of ecological receptors are determined by solving the risk assessment algorithms for the media concentration term and calculating a proposed value at a predetermined level of hazard. EPD's preference for calculating proposed remedial levels is a HQ of 1. The facility must provide justification for a proposed remedial level calculated at a HQ greater than 1.

A flowchart for assessing hazard to ecological receptors and selecting remediation levels for protection of ecological receptors follows:

consulted if this situation arises.

General Process for Assessing Risk and Selecting Remedial Levels for Ecological Receptors



3. COC Remediation Levels

The facility shall provide a table, sorted by medium, that includes the proposed COC remediation levels derived for protection of human receptors, the proposed COC remediation levels derived for protection of ecological receptors, and a column showing the lesser of the two values. This lesser value will, in general, be the proposed remediation level that is protective of human and ecological receptors. The initial remediation levels identified by this methodology may be modified (to either higher or lower levels) by consideration of certain factors outlined in (a) and (b) below.

a. Factors to be Considered when Choosing Remedial Levels for Protection of Human and Ecological Receptors - In performing the risk assessment activities and selecting proposed remedial levels, the facility must consider the following:

i. The remediation must achieve protective levels for current as well as reasonably anticipated future uses of the facility.

ii. Protection of groundwater. Specifically, it must be established during the RFI process (and with supporting documentation in the RFI report) that chemicals left in place or remediated to health based levels are protective of human and ecological receptors as well as groundwater quality (in Georgia, all groundwater is considered a potential source of drinking water). In establishing appropriate groundwater quality criteria, the Director may consider facility-specific health based values that are developed using appropriate risk assessment principles for protection of human receptors, Maximum Contaminant Levels promulgated under the Safe Drinking Water Act, or the sensitivity of the affected ecosystem.

iii. Other pertinent federal or state media concentrations (e.g., State of Georgia water quality standards).

b. Remedial Level Approval - In approving a proposed remediation level or remedy, EPD may take into consideration such items as background levels and achievable quantitation limits, pertinent federal or state requirements, and where appropriate, other features of the proposed remedy including its reliability, effectiveness, practicability, and other applicable aspects.

(In assessing risk and selecting remediation levels, exposure parameters may be set to zero if EPD determines that human and ecological receptors are highly unlikely to be exposed to contaminated media now or in the future.)

Risk assessments and associated proposed remedial levels will not be accepted by EPD for review unless all relevant components have been addressed and the data submitted are of sufficient quantity, quality, and layout to allow a critical and efficient review of the findings. Remediation to background or MCLs will be required if risk-based remediation levels are not approved by the

Director. Any deviations from these methodologies (including the use of new or updated risk assessment procedures must be included in the proposed RFI Workplan for EPD review and approval).

IV. RISK ASSESSMENT METHODOLOGY REFERENCES:

- *Supplemental Guidance to RAGS, Region 4 Bulletins, Human Health Risk Assessment (Interim)* and *Ecological Risk Assessment (Draft),* USEPA Region IV Office of Health Assessment, November 1995.

- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final*, USEPA (EPA/540/1-89/002), December 1989.

- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals), Interim Final*, USEPA (EPA/540/R-92/003), December 1991.

V. CONTACTS

The compliance officer for a facility is the primary contact for questions regarding the implementation of this guidance. If necessary, the compliance officer will route an information request to the Risk Assessment Coordinator for a determination.

APPENDIX A

ALTERNATE DELINEATION (AD)

I. INTRODUCTION

EPD is aware of the various concerns that have been expressed associated with defining the extent of releases to the soil, groundwater, surface water, and air. EPD is also obligated to be fair, equitable, and consistent in its application of the various rules it administers. To this end, EPD cannot disregard the current rules promulgated pursuant to the Georgia Hazardous Waste Management Act (GHWMA) for releases from RCRA regulated units or the Georgia Hazardous Site Response Act (HSRA) which require that releases to soils and groundwater be delineated to background concentration levels. Hence, EPD must require that this standard be applied to releases from SWMUs to be consistent with the overall intent of the existing RCRA and HSRA rules.

Under certain well-defined circumstances, EPD may consider a proposal for an Alternate Delineation (AD). All AD proposals are subject to approval by EPD. Proposals must demonstrate a complete understanding of potential environmental factors (including but not limited to those inputs specified in this document) which affect the results of a risk assessment, and must allow its interpretation with a high degree of confidence. Numerous site specific variables must be considered and addressed in the risk assessment; a complete and accurate data set is necessary to ensure the results of the risk assessment can be accepted with confidence. Assessment of risks posed by environmental media is in a dynamic phase of development (especially with regard to ecological risk assessments). It is EPD's recognition of this dilemma, coupled with the statutorily mandated obligation to make decisions which are based on protection of human health and the environment, that has encouraged EPD to propose the following criteria, combinations thereof, or additional criteria not listed, to support the use of AD for releases. Factors are identified for soils and groundwater.

II. GENERAL CONCEPTS TO BE ADDRESSED IN AN AD PROPOSAL

Sufficient information for delineation and characterization of a release is important so that the facility and the regulator may be as certain as possible that remediation is complete and protective of human health and the environment. Groundwater plumes may be highly irregular in shape, and contaminant concentrations may vary in a non-linear fashion from the source due to such factors as seasonal flow changes, flow direction changes brought about by new industrial, agricultural or municipal supply wells, unanticipated stratigraphic variations, coalescence with other plumes, physical properties of the constituents, etc., which further supports the need for sufficient data to delineate and characterize the plume(s). Delineation and characterization of soil contamination is similarly complicated by such factors as unusual patterns of deposition and the difficulty of establishing background concentration values. Knowledge of the type of release, facility-specific hydrological (i.e. groundwater and surface water) and geological conditions, the behavior of constituents in the environment, the chemical properties of those constituents, and

other facility-specific criteria are relevant to this process.

III. MEDIA-SPECIFIC FACTORS TO BE CONSIDERED IN AN AD PROPOSAL

1. Soil Criteria Objectives

a. A discussion of the considerations necessary to develop acceptable background soil concentrations for each constituent must be presented. As important as actually determining background concentrations is the discussion of laboratory procedures, quality control/quality assurance of data, quantitation limits, method detection limits, the appropriate way to utilize information that is below a quantitation limit, use of the latest version of SW846 test methods and procedures, interferences identified during analyses and how these are presented, and any other relevant considerations regarding sample collection, analysis, and data validation. (Note: Composite samples from either vertical or horizontal locations are not acceptable, unless accompanied by a compelling scientifically supported justification.)

b. For releases known to have affected the soil, it must be shown that: 1.) the contaminated soil is not within a 100-year floodplain, 2.) there is no chance that heavy rains will cause the contamination to flow overland into nearby surface waters, 3.) historical records of past releases show a well defined area in which the extent of contamination can be determined, 4.) contaminants are not highly mobile within the soil, [e.g., based on the organic carbon partition coefficient (K_{oc}), etc.], and 5.) contamination could not have been the result of extensive windblown deposition in adjacent areas that are not within the easily definable zone of contamination.

c. Sufficient information to confirm in a statistically defensible manner (for example, by use of geostatistical parameters) that the releases to soils have been defined to an acceptable level for a satisfactory determination of risk must be provided. Also, there must be a complete set of statistically based data to confirm cleanup has been achieved once the corrective action plan has been completed. The statistical method to be utilized for the analysis of data must be approved by EPD prior to data collection.

2. Groundwater Criteria Objectives

a. Determination of each aquifer's hydraulic characteristics, including a discussion of the soil properties of the overlying vadose zone, coupled with a representative number of samples to demonstrate that the extent of the contamination (vertical and horizontal) can be determined.

b. To support (II.2.a) above, the following information must be provided:

i. The exact date of the release or the age of the facility,
ii. The groundwater flow direction, gradient and, based on the availability of historical groundwater data, potentiometric maps, demonstrating groundwater's behavior should be developed for each 3 to 5 year period from the beginning of the facility's operations to the present,
iii. Local stratigraphy,
iv. Identification and supporting documentation for all confining units potentially affected by the facility,
v. Information on the potential for soils to aid in the remediation of the contamination, in terms of the soils adsorption, absorption, chemistry, cation exchange capacity, pH, etc., and
vi. Other soil properties not identified but which are relevant to the corrective action process.

c. As a screening tool, the facility may use the Ground Water Pollution Susceptibility Map of Georgia (GGS Hydrologic Atlas 20, 1992). Background delineation will be required in the Higher Susceptibility Areas as well as in the Most Significant Ground Water Recharge Areas. Additional constraints, considered on a case-by-case basis include:

i. Anisotropic (karst or fractured) aquifers,
ii. Multiple aquifers/confining units,
iii. Extensively modified (filled or graded) sites,
iv. Overlapping plumes/multiple sources,
v. Combined metals/organics plumes,
vi. Old sources/poor facility records,
vii. Non-aqueous phase liquid plumes,
viii. Well interference (eg. nearby irrigation or municipal wells),
ix. Artificial recharge (eg. nearby land application systems),
x. Perched water,
xi. Tidal Effects,
xii. Salt water or freshwater, and
xiii. Indicator parameters other than COPCs

d. An AD proposal to define plumes to levels higher than background may be considered in areas denoted as Average or Lower Susceptibility Areas in the Ground Water Pollution Susceptibility Map of Georgia (GGS Hydrologic Atlas 20, 1992). Other factors which will be considered favorable for an AD proposal include:

i. Homogeneity and isotropism of affected geologic formations. (Geologic conditions for which this factor is not applicable include karst or carbonate areas and areas with complex geologic structures, such as northwest Georgia.)

ii. Simple plume morphology [Examples: constant concentration gradient (for

a single constituent) from the source toward the downgradient edge. (This would require enough data points to show such a gradient exists and to assure there are no hot spots.); demonstrably low mobility due to contaminant characteristics;

iii. Completeness of information. (Certain facilities may possess a combination of factors, which will allow AD. Example: recent contamination by a known constituent, within a well understood flow system, the extent of which could be calculated.)

e. As with soil, sufficient information must be provided to confirm in a statistically defensible manner that the releases to groundwater have been defined to an acceptable level for a satisfactory determination of risk. Also, there must be a complete set of statistically based data to confirm cleanup has been achieved once the corrective action plan has been completed. The statistical method to be utilized for the analysis of data must be approved by EPD prior to data collection.