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ALTERNATE CONCENTRATION LIMIT GUIDANCE

PART I

ACL POLICY AND INFORMATION REQUIREMENTS

INTERIM FINAL

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DISCLAIMER

This document is intended to assist Regional and State personnel in exercising the discretion conferred by regulation in evaluating applications for ACLs submitted pursuant to 40 CFR 264.94. Conformance with this guidance is expected to result in ACL applications that meet the regulatory standard of protecting human health and the environment. However, EPA will not in all cases limit its review to demonstrations that comport with the guidance set forth herein. This document is not a regulation (i.e., it does not establish a standard of conduct which has the force of law) and should not be used as such. Regional and State personnel must exercise their discretion in using this guidance document as well as other relevant information in determining whether an ACL demonstration meets the regulatory standard.

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

The hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA) require owners and operators of hazardous waste facilities to utilize design features and control measures that prevent the leaking of hazardous waste into ground water. Further, all regulated units (i.e., all surface impoundments, waste piles, land treatment units, and landfills that received hazardous waste after July 26, 1982) are also subject to the ground-water monitoring and corrective action standards of 40 CFR Part 264, Subpart F. To establish the facility's ground- water protection standard (GWPS) under Subpart F (40 CFR 264.92), the Regional Administrator is required to establish in the facility permit, for each hazardous constituent entering the ground water from a regulated unit, a concentration limit that cannot be exceeded. The concentration limits are the "triggers" that determine when corrective action is required.

There are three possible concentration limits that can be used to establish the GWPS:

1. Background levels of the hazardous constituents,
2. Maximum concentrations listed in Table I of Section 264.94(a) of the regulations, or
3. Alternate concentration limits (ACLs).

The first two levels are established in the facility permit as the GWPS, unless the facility owner or operator applies for an ACL. However, some States have non-degradation policies (which are either regulatory or statutory requirements) that prohibit the release of any pollutants into the ground water. These policies may prevent the use of an ACL altogether if the State has an authorized program for 40 CFR Part 264, Subpart F.

This document provides guidance to RCRA facility permit applicants and writers concerning the establishment of ACLs. To obtain an ACL, a permit applicant must demonstrate that the hazardous constituents detected in the ground water will not pose a substantial present or potential hazard to human health or the

environment at the ACL levels. ACLs are granted through the permit process under Parts 264 and 270, and are established in the context of the facility GWPS. The 19 factors, or criteria, that are used to evaluate ACL requests are listed in Section 264.94(b) of the regulation. Detailed information on each of these criteria is not required in every ACL demonstration because each demonstration requires different types and amounts of information, depending on the site-specific characteristics. A separate chapter of this document is devoted to each of these criteria. The criteria are briefly discussed, along with the type, quantity, and quality of information that should be provided, depending on the site-specific characteristics.

Chapter I is an introduction to the ACL guidance; it describes the purpose, intent, and organization of the document. The chapter also defines an ACL, describes Agency policy, and describes how ACLs fit into the RCRA permitting process. A procedure is presented that allows a permit applicant to employ either Agency- established maximum contaminant levels (MCLs) set under the authority of the Safe Drinking Water Act, or Agency-reviewed reference doses or risk-specific levels directly, or after a simple manipulation, as ACLs. For use as ACLs, these levels would have to be approved by EPA for the specific site. This chapter also points out that data from the RCRA Part B permit application may be cross- referenced in the ACL demonstration.

Experience gained over the last several years has allowed the Agency to develop a better understanding of ground-water contamination problems. This has led EPA to develop general policy guidelines for the use of ACLs at RCRA hazardous waste disposal facilities. These guidelines are designed to ensure that ACLs will be protective of human health and the environment.

Three basic policy guidelines have been identified to assist the permit writer and applicant in implementing the ACL process for useable ground water:

1. Ground-water contaminant plumes should not increase in size or concentration above allowable health or environmental exposure levels,

2. Increased facility property holdings should not be used to allow a greater ACL, and

3. ACLs should not be established so as to contaminate off-site ground water above allowable health or environmental exposure levels.

These guidelines are further described in the first chapter. Also described are the ways in which ACLs should be determined for five types of situations.

Chapter I also discusses how the ACL process fits into the rest of the RCRA ground-water protection program. The applicant is cautioned that an ACL based on attenuation mechanisms may not be acceptable to the permitting authority at the end of the post-closure care period. At the conclusion of post-closure care, a more stringent ground-water standard, based only on an allowable exposure level, may be needed because the facility owner has no further RCRA obligations for managing or monitoring the facility.

EPA is also in the process of developing a ground-water protection program for all solid waste management units at RCRA permitted facilities. This program is mandated by Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984 (HSWA). The ACL process, as described in this document, may be useful when assessing corrective action measures at these solid waste management units. In developing this corrective action program, EPA will assess the need to promulgate some additional Subpart F regulations.

Chapter II discusses the data that the permit applicant must submit on the physical and chemical characteristics of the waste constituents. If the permit application sufficiently defines the extent of contamination, additional ground-water sample collection is probably not necessary for ACL purposes. The permit applicant should submit ground-water contamination information in terms of three-dimensional representations of constituent concentrations. The permit applicant needs to submit data on any factors relating to the stability and mobility of the waste constituents in the ground water if the point of exposure is different from the point of compliance. These factors may include density, solubility, vapor pressure, viscosity, and octanol-water partitioning coefficient of each constituent for which an ACL is requested.

Chapter III discusses the data needed to describe the hydrogeologic properties of the site. General descriptions of the geologic and hydrologic conditions at the facility should be part of all ACL demonstrations. The geologic and hydrologic properties of each of the individual strata beneath a site that are likely to affect ground-water contaminant migration should be submitted in the ACL demonstration. Much of the data should already be available to the permit applicant if other RCRA permitting requirements have been fulfilled. The important geologic attributes of a site include:

1. Soil and rock characteristics,
2. Geologic structure, and
3. Geomorphology and topography.

In ACL demonstrations where soil and other matrix attenuation mechanisms are used to justify that exposure to ground-water contaminants will be minimal or prevented, data on attenuative properties must be discussed. The near-surface stratigraphic units located in the zone of saturation must be characterized for the hydrologic parameters of hydraulic conductivity (vertical and horizontal), specific yield (unconfined aquifer) or specific storage (confined aquifer), and effective porosity.

Chapter IV discusses the ground-water quantity and flow direction information that is used to assess contaminant transport. The general RCRA permit requirements specify the submittal of ground-water flow data. This data should be adequate for on-site determinations of ground-water quantity and flow direction; however, additional data may be required if off-site determinations of quantity and flow are needed for the ACL demonstration. Ground-water quantity can be estimated from hydrologic parameters such as specific yield for unconfined aquifers and specific storage for confined aquifers. The use of Darcy's law for determining ground-water flow quantity is acceptable for homogeneous and isotropic aquifers.

The hydrogeologic portion of all ACL demonstrations should include a general description of both horizontal and vertical ground-water flow components. ACL demonstrations based on attenuation arguments need a more in-depth discussion of ground-water flow. In these situations, the horizontal ground-water flow description should include a flow net based on ground-water elevation measure-

ments taken from monitoring wells or piezometers screened at similar elevations in the same saturated zone. Facilities should have several clusters of piezometers for vertical gradient determinations. Facilities that are located in environmental settings that exhibit temporal variation in ground-water flow direction should describe the extent to which the flow change occurs.

Chapter V discusses the types of precipitation data that should be submitted in an ACL demonstration. ACL demonstrations based on contaminant attenuation need to include a discussion of precipitation, which should be focused on the site's hydrologic regime. If the applicant's ACL demonstration clearly shows that ground-water discharge to surface waters is unlikely, then the discussion of precipitation effects can be limited to infiltration and ground-water recharge. However, if ground-water discharge to surface water is an important element of the ACL demonstration, then precipitation events should be related to ground-water recharge, discharge, and surface water hydrology.

Chapter VI discusses the proximity of surface water and ground-water users and the information that should be submitted on these users. The level of information necessary to satisfy the proximity of users requirement depends on the basis of the ACL. Only a general discussion of surface water and ground-water users is necessary if ACLs are based on exposure to the contaminants at the point of compliance, immediately at the edge of the waste management area. However, specific data on the physical characteristics of a surface water body are necessary if the applicant is attempting to show that the contaminants will safely and quickly attenuate into a surface water body. In order to assess the likelihood of exposure of ground-water users, ACL demonstrations should discuss the proximity of ground-water users to the facility.

Chapter VII discusses the factors needed to determine current and future uses of ground water and surface water in the vicinity of the facility. The permit applicant needs to examine only the pertinent aspects of ground-water and surface water uses. Permit applicants must submit information on the types of ground-water uses in the vicinity of the facility, unless they base the ACL on allowable exposure levels at the point of compliance. Surface water uses should be discussed by the ACL applicant if contaminated ground water can migrate to surface waters.

Chapter VIII is concerned with the existing quality of ground water and surface water and other sources of contamination. In order for "benchmark" levels of contamination to be set, the background levels of hazardous constituents in the ground water and surface water should be established. For ACL purposes, background water quality is the quality that would be expected to be found if the facility's regulated unit(s) was not leaking contaminants. Background monitoring wells must yield ground-water samples from the uppermost aquifer representative of the quality of ground water that has not been affected by leakage from the facility's regulated unit. Background surface water quality needs to be assessed only in cases where surface waters are receiving contaminated ground-water discharges. The permit applicant should also examine the possibility of other sources of contamination if the upgradient waters in the vicinity of the facility are contaminated and ACLs are requested above allowable exposure levels. This will give the permit applicant information for assessing cumulative impacts associated with any contamination emanating from the facility.

Chapter IX discusses the health risk assessment. The purpose of the health risk assessment is to determine allowable concentrations at the point of exposure for the constituents for which ACLs are requested. A detailed health risk assessment should be submitted in all ACL demonstrations, unless the point of exposure is established at the point of compliance and either Agency-established MCLs or Agency-reviewed allowable dose levels are used at this point. If human exposure could occur, the permit applicant is responsible for providing information on the health effects of the hazardous constituents present in the ground water for which ACLs are requested. The health risk assessment should be based on conservative health assumptions. The applicant should distinguish between ground-water contaminants having threshold (toxic) and non-threshold (carcinogenic) effects. The Agency is currently compiling toxicity information on many of the hazardous constituents which should be useful in preparing ACL demonstrations.

Chapter X discusses data that should be submitted on the potential impacts to the environment. The initial step in assessing possible environmental impacts is to determine the probable exposure pathways for hazardous constituents to reach environmental receptors. For ACL purposes, the receptors of concern include wildlife and vegetation in aquatic and terrestrial environments; agricultural crops, products, and lands; and physical structures. The permit applicant should examine

the potential impacts to the receptors discussed above if the ACLs are based on attenuation and exposure to hazardous constituents is likely to occur. Otherwise, the permit applicant should discuss specific data that support no probable exposure and explain why the potential environmental impact assessment is not needed. If there is a likely pathway for wildlife and vegetation to become exposed to contaminants, then environmental toxicity factors should be examined.

The permit applicant should discuss the presence of any endangered or threatened species in terrestrial or surface water environments near the facility. If any endangered or threatened species are in the area, then the permit applicant should discuss the potential impacts of the contaminated ground water, including critical habitat impacts, on the species.

Physical structures can also be adversely affected by hazardous constituents in the ground water. The determination of potential impacts to and contamination of physical structures in the area around the facility requires the examination of exposure pathways, waste characteristics, and construction materials and techniques. Physical structures of concern include buildings, buried cables and pipes, railroad beds, roads, parking areas, and machinery.

Chapter XI discusses data needed to determine the persistence of the contaminants in the environment and the permanence of the adverse effects. If ACLs are based on attenuation arguments, the applicant should discuss the process by which each ACL constituent will degrade, either from a ground-water perspective, surface water perspective, or a combination of both, depending on the site-specific situation. Data on the permanence of the adverse effects resulting from exposure to the ACL constituents will be required only if the ACL demonstration is based on attenuation arguments. Data on permanence is needed to determine the long-term effects associated with exposure to the ACL constituents.

Chapter XII presents the summary and conclusions of the ACL guidance document. This chapter emphasizes the independent nature of each ACL demonstration and presents the time frame of the ACL process. Information on each of the criteria discussed in this guidance document is not required in every ACL demonstration. Each ACL demonstration will reflect site-specific environmental

properties and waste characteristics. As part of the ground-water protection standard, an ACL is in effect during the compliance period. If, at the end of the compliance period, the owner or operator is engaged in a corrective action program, the compliance period is extended until the owner or operator can demonstrate that the GWPS, which may contain ACLs, has not been exceeded for a period of three consecutive years.

Chapter XIII is a list of references cited throughout the guidance. The permit applicant is advised to use these documents since approval of an ACL is highly dependent upon the technical strength of the demonstration.

CHAPTER I

INTRODUCTION

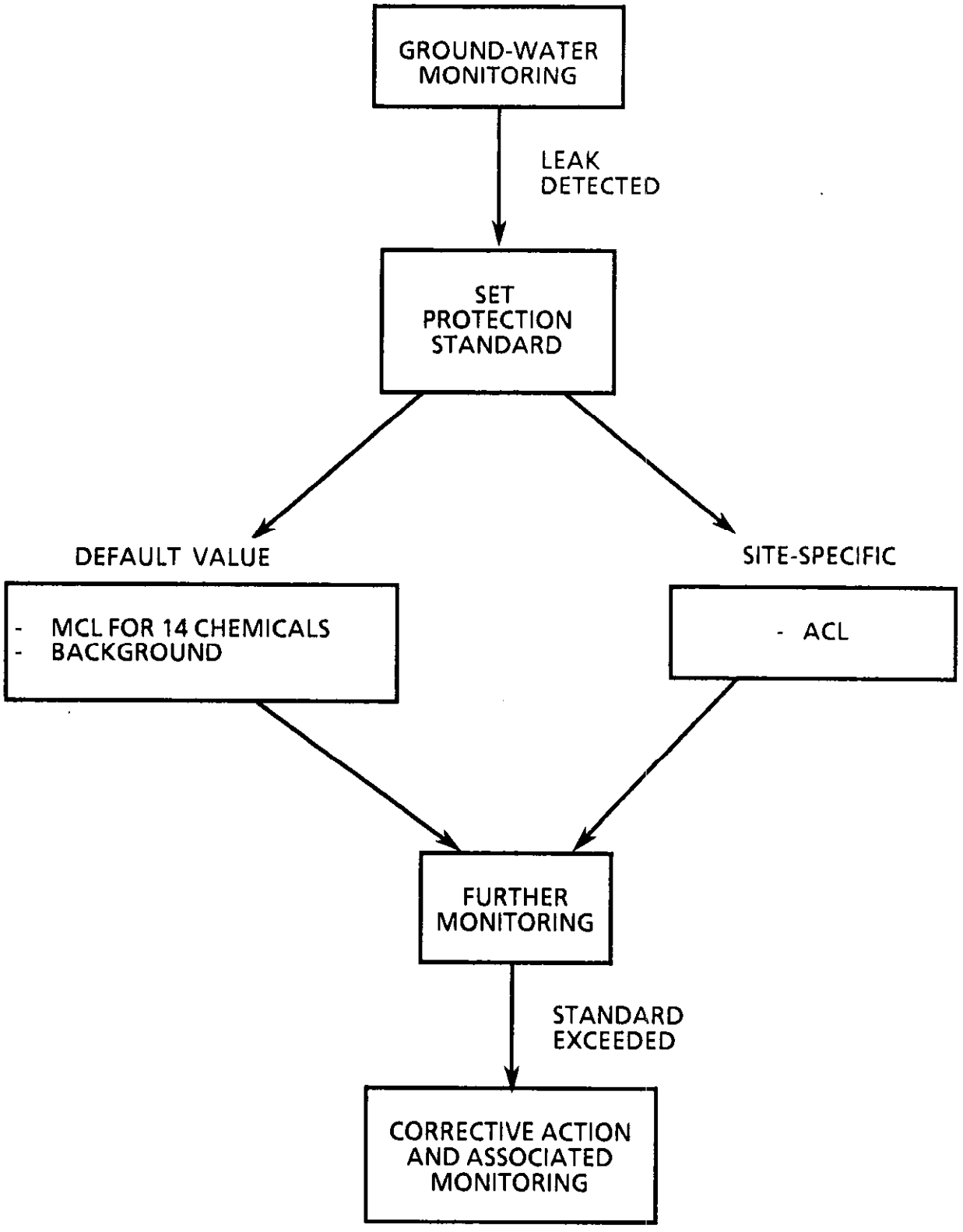
Hazardous waste facilities permitted under the Resource Conservation and Recovery Act (RCRA) regulations (40 CFR Parts 264 and 270) are required to be designed and operated in a manner that will prevent ground-water contamination. If leakage of hazardous constituents into the ground water is detected at a RCRA facility, the regulations require the establishment of a ground-water protection standard at that facility. This standard establishes a limit on the amount of ground-water contamination that can be allowed. The ground-water protection standard is an essential element in the Agency's strategy to ensure that public health and the environment are not endangered by any contamination of ground water resulting from the treatment, storage, or disposal of hazardous wastes. As such, the standard will indicate when ground-water clean-up is necessary to control contamination that has emerged from a hazardous waste facility.

The principal elements of the ground-water protection standard are discussed in Section 264.92 of the regulations. For each hazardous constituent entering the ground water from a regulated unit, a concentration limit must be established that will serve as a limit beyond which degradation of ground-water quality will not be allowed. There are three possible concentration limits that can be used to establish the ground-water protection standard:

1. Background levels of the constituents,
2. Maximum concentration levels listed in Table 1 of Section 264.94(a) of the regulations, or
3. Alternate concentration limits (see Figure 1).

FIGURE 1

RCRA GROUND-WATER PROTECTION PROCESS



Section 264.94 contains the regulatory framework for these concentration limits. The approach used by the regulations is to adopt widely accepted environmental performance standards (i.e., MCLs in Table 1), when available, as concentration limits. However, because of the lack of currently available standards, specific concentration limits for only a few specific constituents have been included in the regulations.

Maximum contaminant limits are established for 14 hazardous constituents under the National Interim Primary Drinking Water Standards and are listed in Table I of Section 264.94(a) of the regulations. If a constituent is not listed in Table 1, the standard becomes no degradation beyond background water quality. In such cases, the concentration limit is set at background level. However, variances from these standards are available where the permit applicant can demonstrate that the constituents will not pose a substantial present or potential hazard to human health or the environment. In such cases, the applicant may ask for an "alternate concentration limit" (ACL) under Section 264.94(b) of the regulations. This section of the regulations lists nineteen criteria to be applied in ACL demonstrations. The applicant should, however, be aware of any State or local laws regulating ground water. Many States prohibit the release of any pollutants into the ground water. If the State has an authorized program for 40 CFR Part 264, Subpart F and does prohibit such releases, ACLs may not be allowed.

This document serves to provide guidance to permit applicants seeking ACLs and permit writers evaluating ACL demonstrations. The document describes EPA's implementation guidelines and elaborates on the application of the 19 criteria. Nine of the criteria are for ground-water contamination pathways, and ten are for surface water pathways. The document is divided into 13 chapters that include an introduction, an explanation of each of the criteria in the regulation, a conclusion, and references.

This guidance may also be useful for Record of Decision preparations pursuant to the EPA CERCLA program (Superfund), for State permit writers, for performing remedial facility investigations, or for evaluating corrective action programs for other types of waste management facilities. In applying this guidance to Superfund sites or for State permits, the users must be cognizant of any differences between

the requirements of their programs and the RCRA regulations and permitting programs.

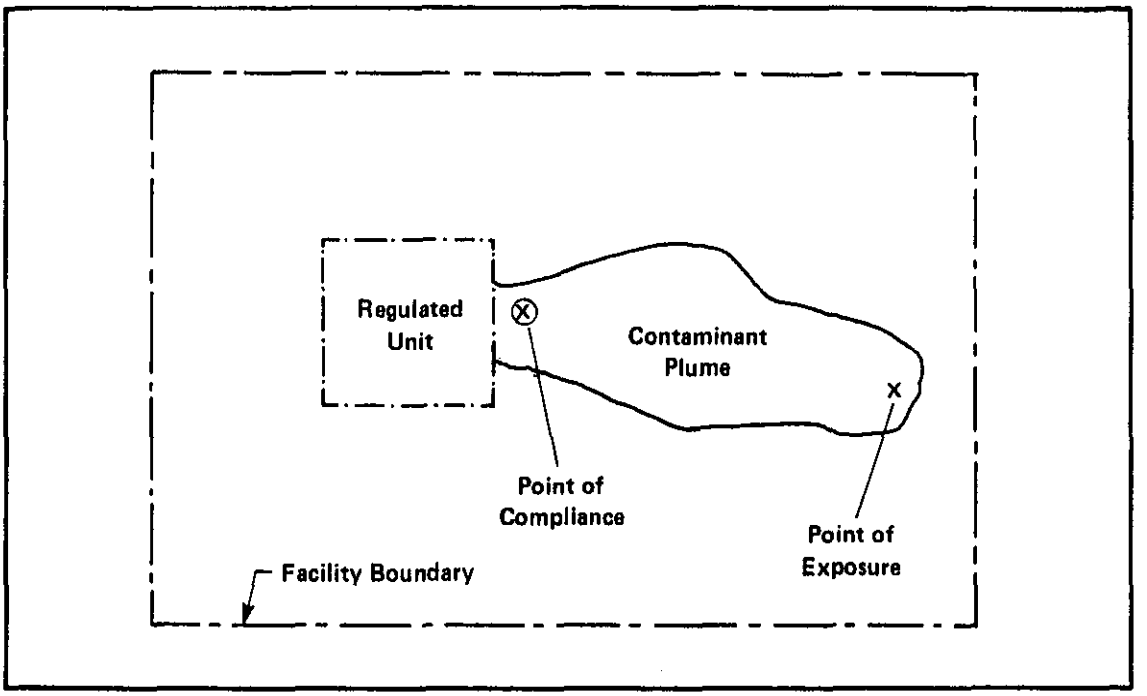
Alternate concentration limits are discussed in the RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities under Subpart F: Ground-water Protection (U.S. EPA 1982a). The permit applicant and the reviewer should become familiar with the ground-water protection regulations. ACLs are granted through the permit process under Parts 264 and 270. Through this process, the public is afforded opportunity to participate in the establishment of ACLs.

The Agency is developing a strategy for implementing corrective action at solid waste management units. The overall goal of this strategy is consistent with that of the Agency's Subpart F ground-water protection program: the protection of human health and the environment. The ACL process described in this document may be useful when evaluating the corrective action programs at these solid waste management units.

ACL Definitions

To establish ACLs, two points must be defined on a RCRA facility's property (see Figure 2): the Point of Compliance (POC) and the Point of Exposure (POE). The POC is defined in the Subpart F Regulations (40 CFR § 264.95) as a "vertical surface" located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated unit. The POC is the place in the uppermost aquifer where ground-water monitoring takes place and the ground-water protection standard is set. The ACL, if it is established in the permit, would be set at this point.

The point of exposure (POE) is the point at which it is assumed a potential receptor can come in contact, either now or in the future, with the contaminated ground water. Therefore, the ground-water quality at the POE must be protective of that receptor. For example, a facility may have a ground-water contaminant plume restricted to a small portion of its property. In this case, it may be appropriate to assume that people will be exposed through a drinking water well to the ground water immediately at the edge of the plume. The ground water at that



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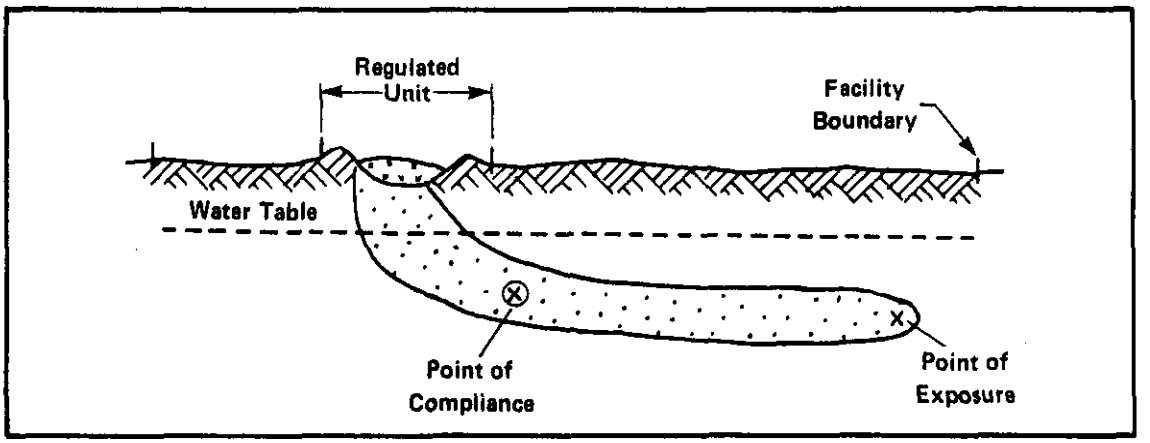


CROSS-SECTION VIEW

POINT OF EXPOSURE (POE) – Point at which potential exposure to contaminants is assumed. Location is site specific. Allowable exposure is met here.

POINT OF COMPLIANCE (POC) – The point on the downgradient side of the unit where the ground-water protection standard is met. The ACL is set here.

CONTAMINANT PLUME – The volume of ground water that contains the leaking pollutants.

FACILITY BOUNDARY – The property boundary of the facility.

REGULATED UNIT – The area where the hazardous wastes are kept (landfill, surface impoundment).

Figure 2. Definitions

point, the POE, must then be safe for human consumption. Likewise, if the ground-water contamination is discharging to on-site surface water, the potential receptor may, in some cases, be an aquatic organism. In this example, the aquatic organisms must be protected from adverse effects of the discharging contaminants.

Understanding and identifying the spatial relationship between the POC and the POE is critical in the establishment of an ACL. Mechanisms that attenuate contaminants may be considered only over the area between the POC and the downgradient POE. If the POE is established at the POC, then no form of attenuation will be considered in setting the ACL. In such a case (POC = POE), the ACL would be equal to the allowable health or environmental exposure level, with the assumption that exposure would occur at the waste management unit boundary. However, if the POE is removed a specified distance from the POC, then appropriate and conservative estimates of contaminant attenuation may be used in calculating the ACL. These mechanisms of attenuation would only be considered over that distance between the POC and the POE. For example, if the POE is 50 meters downgradient of the POC, then attenuation could be conservatively estimated from the volumetric transport of ground water in relation to the mass loading of the leaking constituents over that 50 meters. The attenuation factor could then be applied to the allowable health or environmental exposure level at the POE to derive the ACL.

The following section discusses EPA's ACL policy. After presenting the basic philosophy and guidelines of the policy, five case examples are described. These examples tell the reader where the POE should be established in similar real-world situations. Following these examples is a guide for employing this document to prepare an acceptable ACL demonstration.

ACL Policy

Experience gained over the last several years has allowed the Agency to develop a better understanding of ground-water contamination problems. This has led EPA to develop general policy guidelines for the use of ACLs at RCRA hazardous waste disposal facilities. These guidelines are designed to establish an ACL procedure that will be protective of human health and the environment.

Three basic policy guidelines have been identified to assist the permit writer and applicant in implementing the ACL process for useable ground water:

1. Ground-water contaminant plumes should not increase in size or concentration above allowable health or environmental exposure levels;

2. Increased facility property holdings should not be used to allow a greater ACL; and

3. ACLs should not be established so as to contaminate off-site ground water above allowable health or environmental exposure levels.

Useable ground water is either a current or potential drinking water resource or ground water that has some other beneficial use (see Chapter VII for more discussion). ACLs in unuseable ground water will be assessed on a case-by-case basis.

Regardless of where the POE is established, there is one overriding policy. That is, contaminant plumes in useable ground water will not be allowed to increase in size above acceptable levels. This "no growth" policy applies both to the mass of contaminants releasing to ground water and to the volumetric extent of the plume itself. The implementation of source control measures may be necessary to prevent the release of contaminants above their permissible level, the ACL. This may require that a regulated unit meet the appropriate Part 264 minimum technology requirements if the unit has significant leakage. All facilities with RCRA units that have plumes in useable ground water must prevent these plumes from expanding out and contaminating more ground water. This will require that the leading edge of the plume not move. The leading edge of the plume is identified by ground water that does not exceed an allowable health or environmental exposure level.

The policy of not allowing plumes to increase in size or concentration is protective of human health and the environment by eliminating continued, uncontrolled releases of hazardous constituents. By limiting the growth of ground-water contamination, the degradation of the ground-water resource is restricted and the uncertainty of eventually cleaning up the contamination is reduced. This

effect applies to both the areal extent of the contamination and the contaminant concentrations within the plume. If the extent of the contamination increases in size, the probability of ever capturing and withdrawing the contamination is significantly reduced. Likewise, if the contaminant concentrations within the plume increase, then the aquifer matrix may leach contaminants into the ground water over a long period of time. If this is the case, then eventual cleanup of the contamination may be impossible.

In determining the extent of an on-site plume, the permitting authority should consider only property that the facility owned at the time of initial permit application. A facility may not use recently purchased property to encompass a plume in order to allow the use of larger attenuation factors in their ACL calculations. The permit writer should consider only the original property, as defined in the initial Part B application, in determining an allowable ACL.

Corrective Action

The Agency is in the process of developing a corrective action program for all solid waste management units (SWMUs) at RCRA permitted facilities. This program is mandated by Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984 (HSWA). The ACL process, as described in this document, may be useful in determining the appropriate corrective measures for ground-water contamination at these other solid waste management units.

In developing this SWMU corrective action program, EPA will also assess the need to promulgate some additional regulations for ground-water corrective action at regulated units.

Closure

If a RCRA facility owner or operator is considering applying for an ACL, he or she should be aware of EPA's closure and post-closure regulations and policy as they apply to ground-water monitoring. It is likely that if a contaminant is left in useable ground water above a health or environmental exposure level, as might be the case with an ACL based on attenuation arguments, the post-closure care period for the facility may be extended beyond 30 years (40 CFR §264.117(a)(2)(ii)). In this

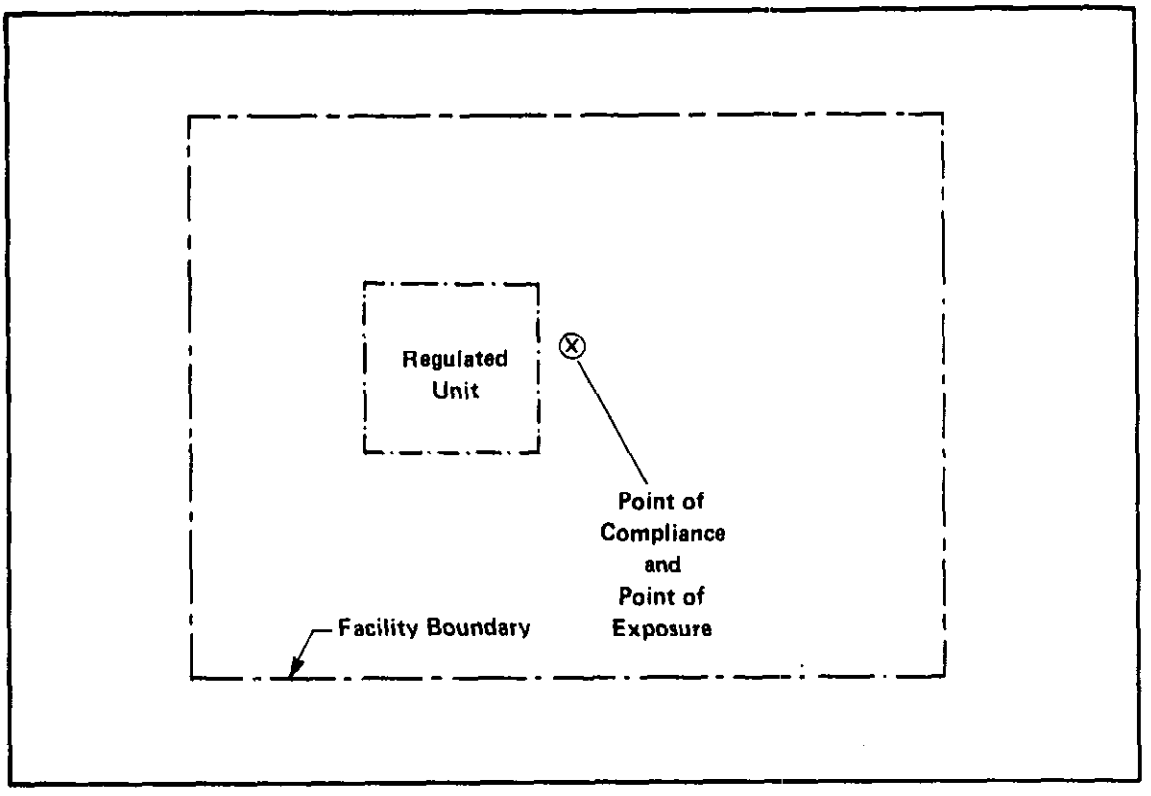
situation, an owner or operator may discontinue post-closure care and ground-water monitoring only after successfully demonstrating that all the ground water at a site is safe for all potential receptors. A more stringent ground-water standard, based only on allowable exposure levels for units above useable ground water, may be needed because the facility owner has no further RCRA obligations for managing and monitoring the facility at the end of post-closure care. If, at any time during the post-closure care or the compliance period under §264.96, a substantial threat to human health or the environment is identified, the permit can be modified to include a lower ground-water protection standard and an extended post-closure care program.

Examples

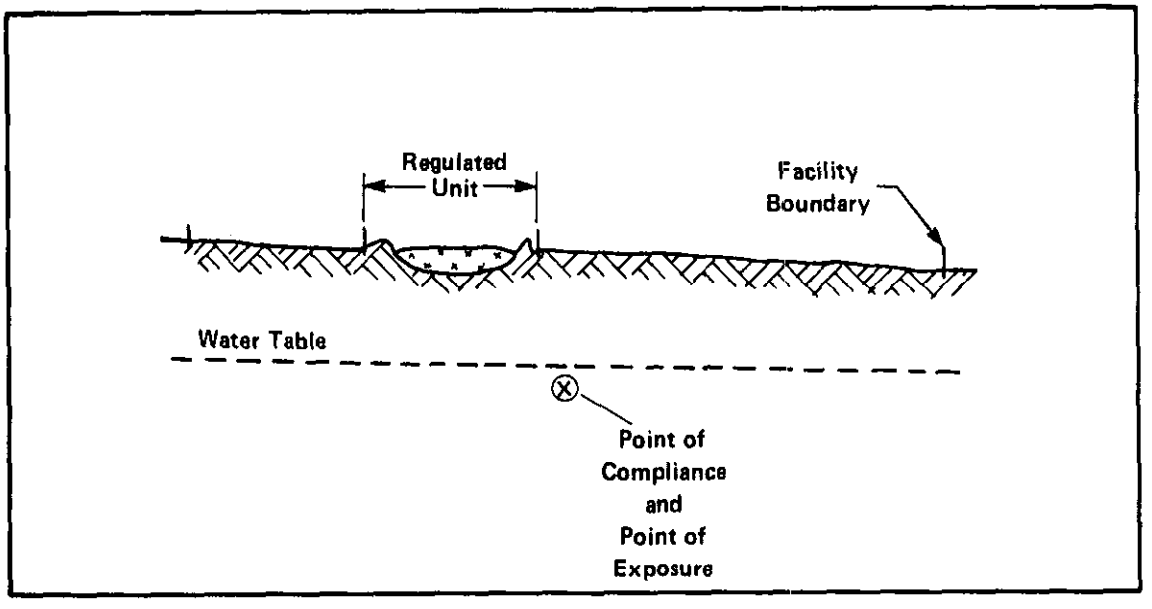
To provide national consistency in calculations used to estimate the potential impacts of releases of hazardous constituents to ground water from regulated units, Agency policy is that the points of exposure be assumed as discussed below. These POEs were chosen because the Agency believes that they are realistic and conservative estimates of where environmental or human receptors would likely be exposed to the contaminants.

The Agency believes that this method is conservative enough to be protective of human health and the environment in situations that would be encountered during the setting of ACLs. These POEs were also deemed necessary because of both the persistent nature of many toxic chemicals in the environment and the need to prevent the further migration of these compounds.

Case 1: For regulated units located above useable ground water that have not detected ground-water contamination at the time of permit issuance, the potential POE will be assumed to be directly at the POC (Figure 3). That is, for units at which no ground-water contaminant plume exists, the potential point of exposure is assumed to be at the waste management unit boundary. Therefore, no attenuation can be presumed for contaminants that leach from a unit in the future. Fate and transport arguments cannot be used to support ACL demonstrations if no ground-



PLAN VIEW



CROSS-SECTION VIEW

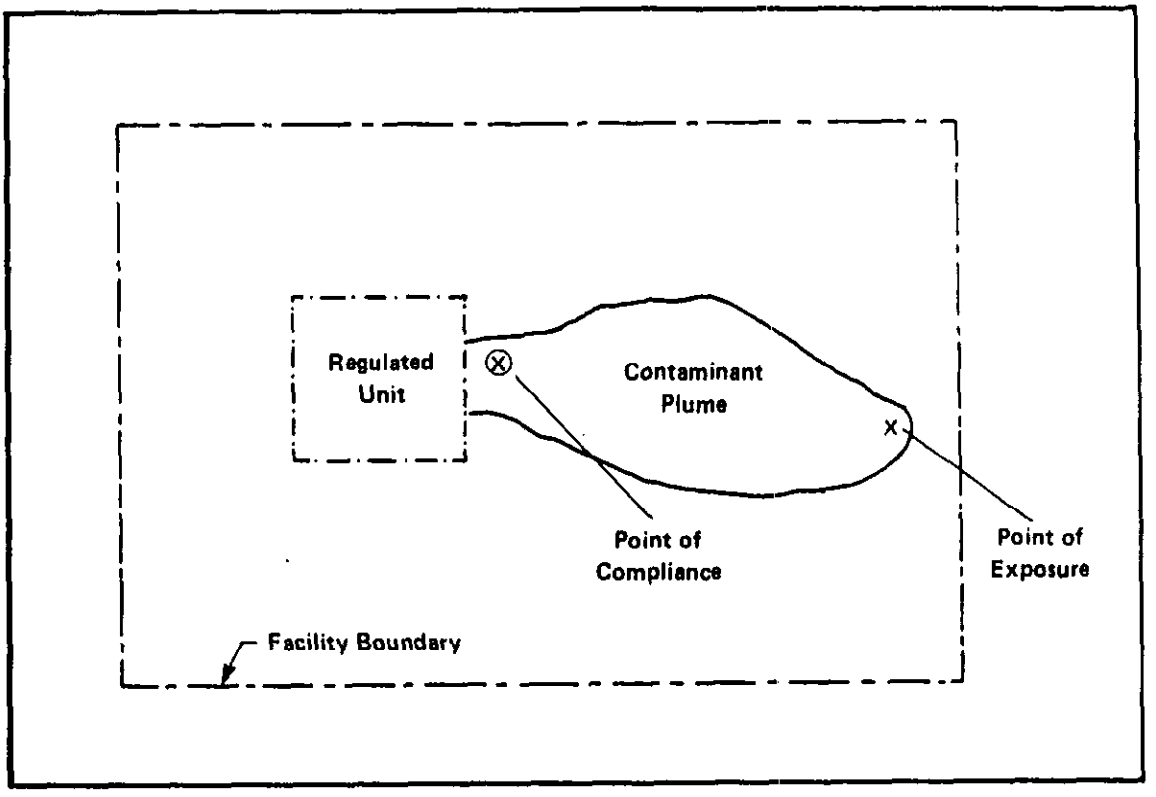
Figure 3. Case 1: No Contamination at Original Permit Issuance

water contamination plume exists at the time of permit issuance. This policy will help to prevent contaminants from entering the ground water above allowable health and environmental levels. All new units seeking permits for operation and old units that have not detected contamination will be held to this policy.

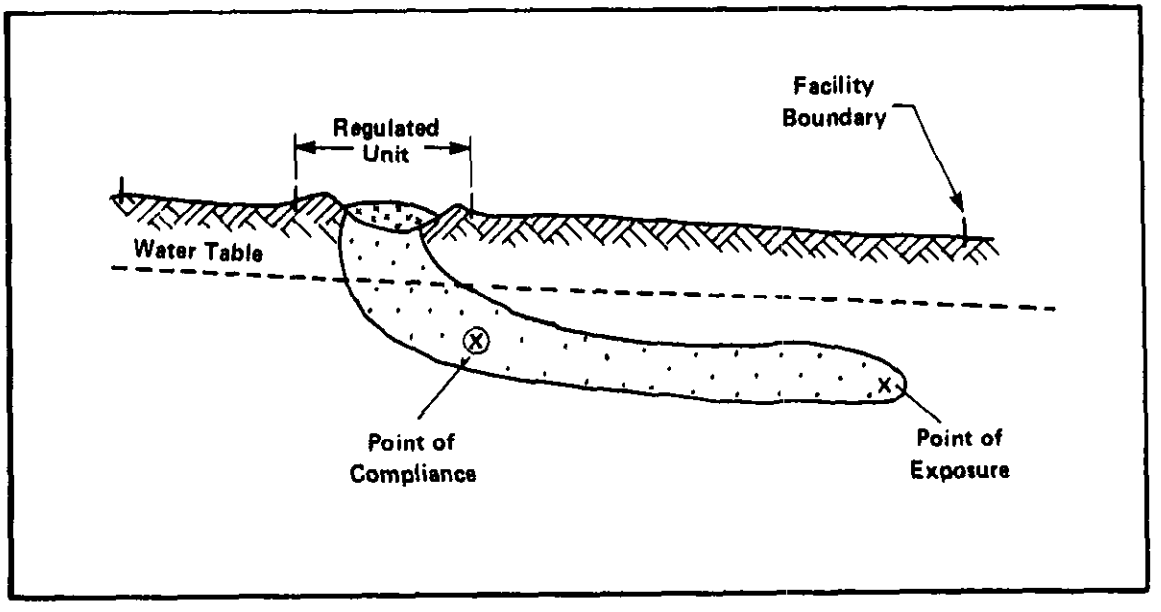
Case 2: For units located above useable ground water that already have existing contamination that is confined to the facility property, the POE will be assumed to be no farther from the POC than the outer edge of the existing plume (Figure 4). If the permitting authority concludes it is protective of human health and the environment, then the point of exposure may be set at the leading edge of the plume. In this situation, mechanisms of contaminant attenuation (fate and transport) may be considered in establishing the ACL at the point of compliance. Monitoring for the ACL constituents at the POE should be performed to verify the attenuation mechanisms that were accounted for.

Case 3: For units located over useable ground water, if the leading edge of the plume extends off the facility property, the point of exposure will be assumed to be no farther from the POC than the facility property boundary (Figure 5). Fate and transport arguments may then be applied to the ground-water contamination between the POC and the POE at the facility boundary, assuming there is no possible route of exposure on the facility property. At no time may the designated POE be beyond the original facility boundary.

Case 4: ACLs may be based on contaminant discharge into a surface water body if a facility owns the property up to the surface water body (Figure 6). The permitting authority should allow this only if: (1) the contaminant plume has already reached the surface water body, (2) the contaminants do not cause a statistically significant increase over background in the surface water concentrations of those contaminants, and (3) the contaminants will not reach a receptor at an unsafe level before they reach the surface water body. Though it may be acceptable to allow some contaminants in the ground water to discharge into a nearby surface water body, in no case may the ACL be derived so as to allow releases into that surface water body that result in a statistically significant increase in the concentration of the contaminants in the surface water body.

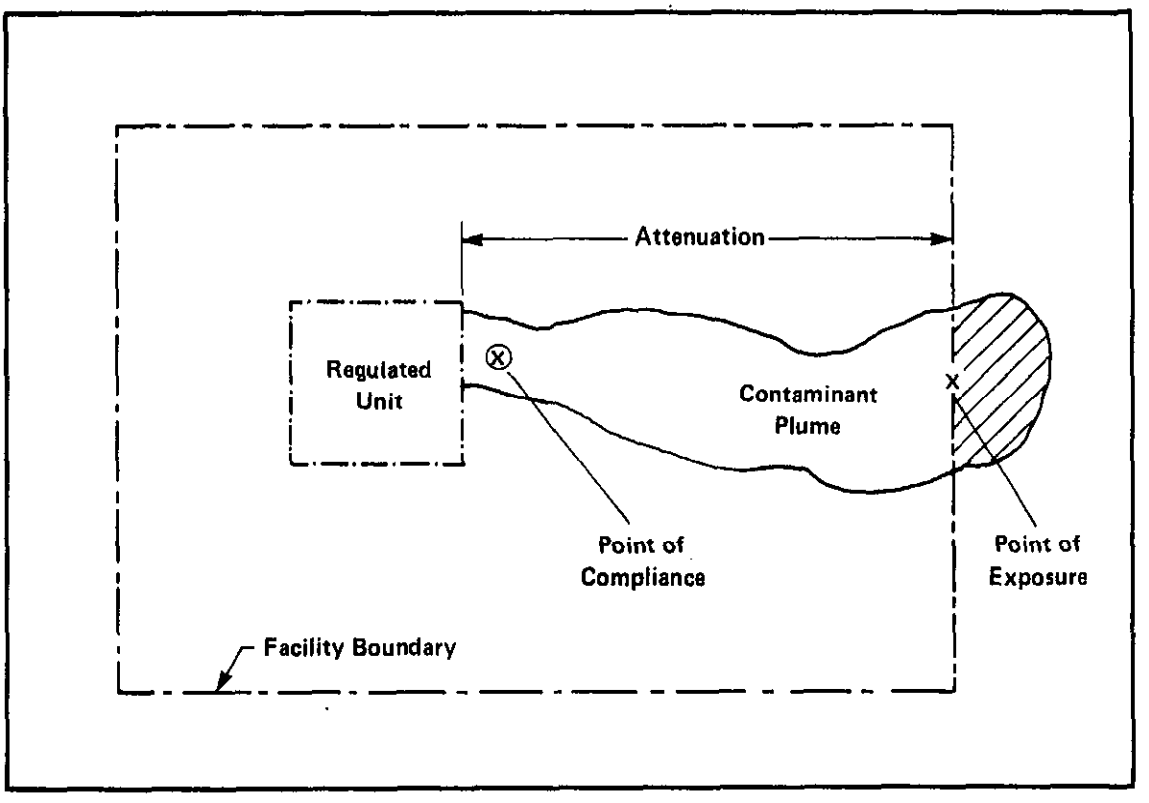


PLAN VIEW

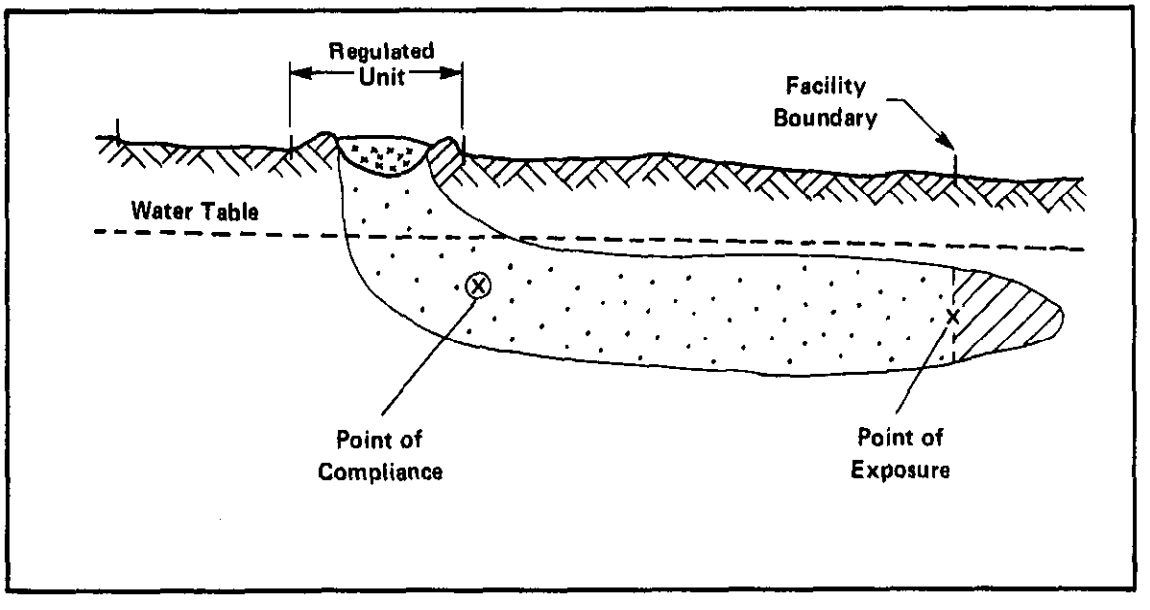


CROSS-SECTION VIEW

Figure 4. Case 2: Contamination Confined to Facility Property

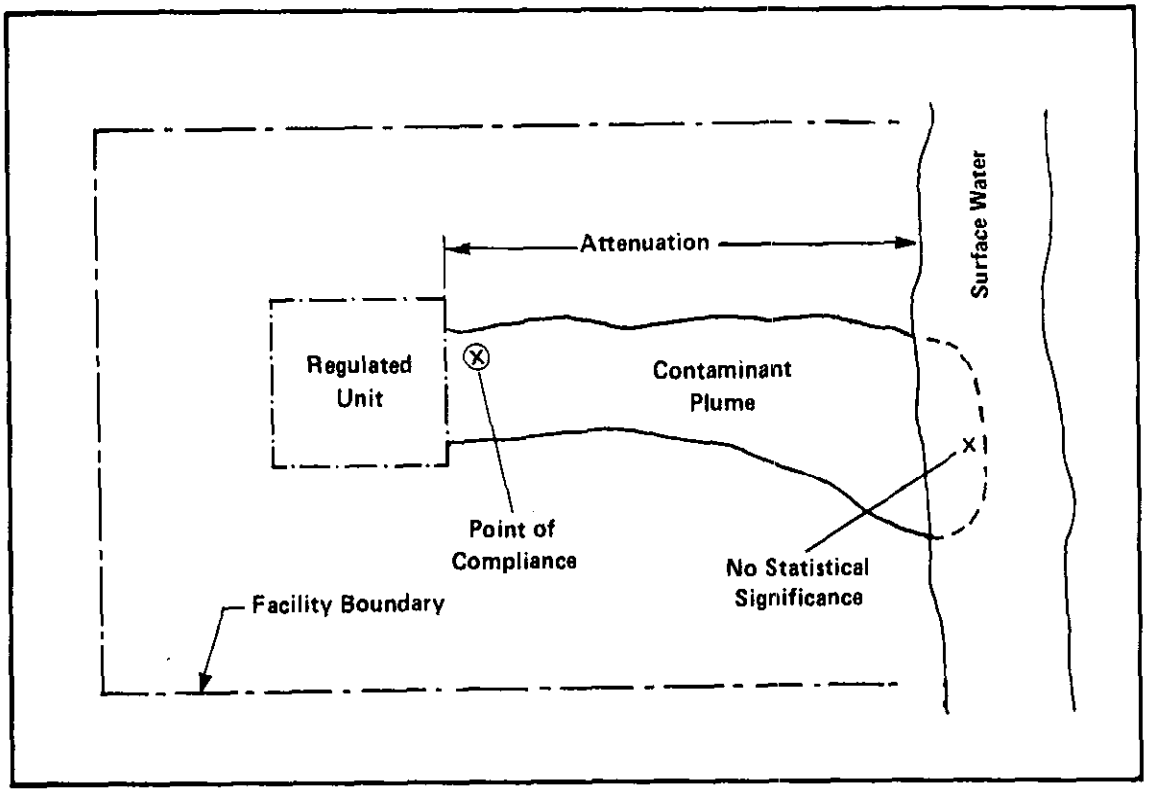


PLAN VIEW

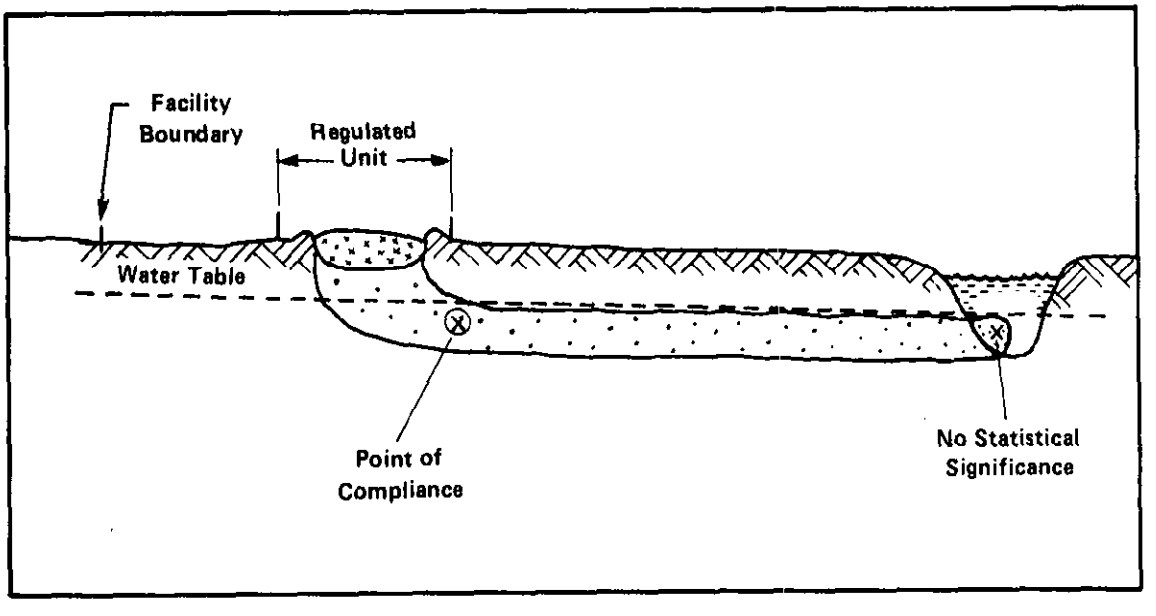


CROSS-SECTION VIEW

Figure 5. Case 3: Contamination that Extends Off-Site



PLAN VIEW



CROSS-SECTION VIEW

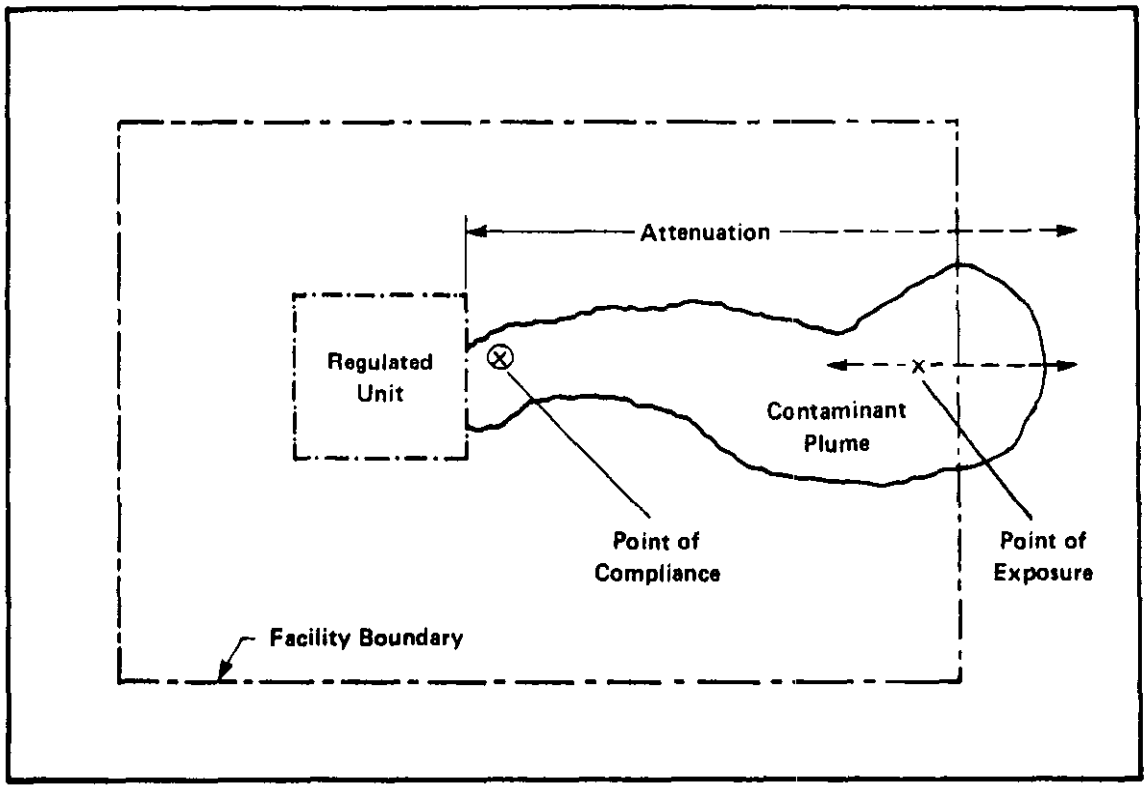
Figure 6. Case 4: Contamination Discharging into a Surface Water Body

Case 5: For those units over a nonpotable aquifer, the location of the POE will be established on a case-by-case basis (Figure 7). Such non-potable aquifers will usually be highly saline, containing more than 10,000 ppm total dissolved solids. In such situations, protection of environmental receptors may be the overriding factor. In any case, the ACL must be established so as to pose no unacceptable risk to public health and the environment. To apply this option, the permit applicant must thoroughly demonstrate that the nonpotable aquifer is isolated from any potable aquifer.

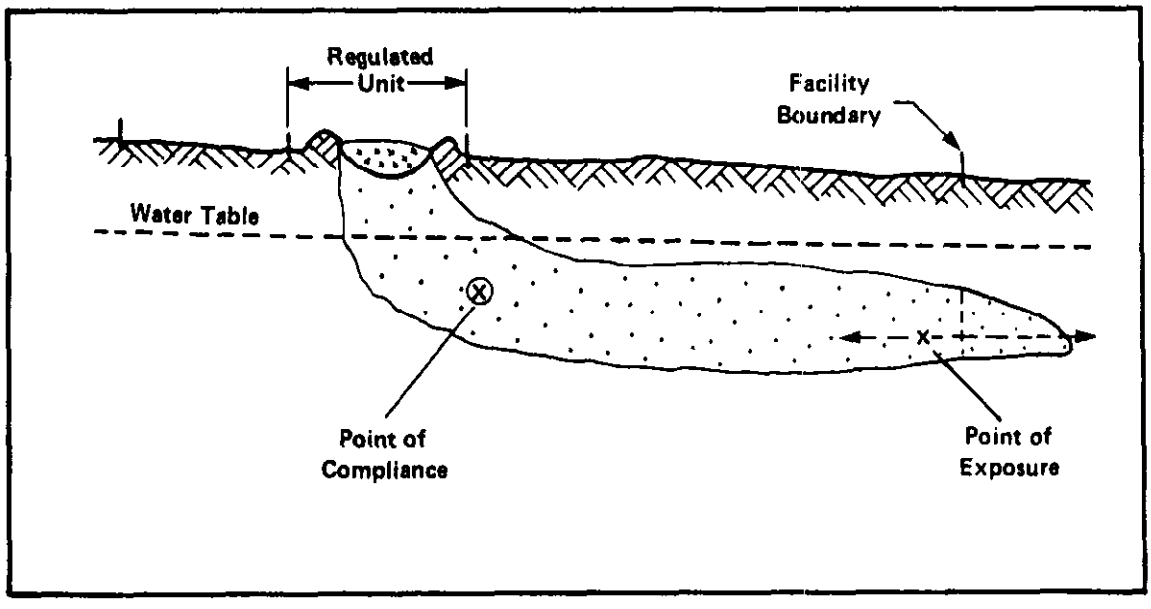
ACL Information Requirements

The type and amount of information needed for an ACL demonstration depends on the placement of the point of exposure (POE) and the site-specific characteristics. An ACL demonstration may cross reference many sections of the Part B Permit Application. Appendix A contains a listing of the types of information that may be cross referenced from the permit application. For new units, units with no ground- water contamination (Case 1), or units for which the owner or operator desires an ACL to be set at the allowable health or environmental exposure level, relatively little additional information beyond that already supplied in the permit application will normally be required. If the unit already has caused ground-water contamination and the owner or operator wishes to take into account mechanisms of attenuation in deriving the ACL (Cases 2-5), more information will be required.

The simplest and quickest method for deriving the ACL in all situations will be to establish the POE at the POC. Even for those sites with gross contamination, setting the POE at the POC may be the least expensive option because high levels of contamination will usually require major source control and corrective action measures, regardless of the ACL. By setting the POE at the POC, the owner or operator may save significant amounts of time and money by not having to gather and organize the additional information required for deriving an ACL that accounts for attenuation mechanisms.



PLAN VIEW



CROSS-SECTION VIEW

Figure 7. Case 5: Contamination in a Non-Potable Aquifer

No matter where the POE is established, an allowable health or environmental exposure level must be determined for each constituent for which an ACL is requested. The following discussion outlines the method used to choose the appropriate health or environmental exposure level, and the types of information necessary to derive the attenuation factor(s). This section is meant to be used as a guide to the rest of this document; detailed technical discussions are reserved for the following chapters. Five ACL Case Studies will be available in the Summer of 1987 to help the owner or operator prepare an acceptable ACL demonstration.

The appropriate allowable health or environmental exposure level will be dependent on the most vulnerable receptor near the facility. The most vulnerable receptor is that receptor, human or environmental, that has the lowest tolerance to the hazardous constituent(s) for which the ACL is being requested. In most cases, the receptors will be humans exposed to the contaminated ground water via ingestion (i.e., drinking). However, at times the most vulnerable receptor will be an environmental receptor.

Agency-reviewed dose levels for humans are available to quickly determine allowable concentration levels for many hazardous constituents. Chapter IX of this document discusses the method for determining an allowable exposure level for humans. Essentially, the applicant can use Maximum Contaminant Limits (MCLs), or if MCLs are not available, obtain the appropriate allowable dose level (Reference Dose (RfD) for systemic toxicant, Risk Specific Dose (RSD) for carcinogens) from EPA and use the appropriate formula on page 9-7 of this document to derive the allowable concentration level for humans.

If environmental receptors exist in the vicinity of the facility, the vulnerability of these receptors must be investigated. Chapter X provides a discussion of these environmental receptors. In many cases, the critical environmental receptor will be aquatic life in the nearest downgradient surface water body (including bogs and wetlands); however, threatened and endangered species, terrestrial organisms, agricultural products, and physical structures should not be overlooked. The applicant should compare the allowable exposure levels for the various receptors near the facility. The lowest level should be chosen as the concentration level at the POE. This method is necessary because the concentration of the contaminants at

the point of exposure must be protective of the potential receptor that is most vulnerable to that contaminant.

Once the allowable exposure concentrations for the point of exposure are chosen, the applicant needs to collect and organize any other necessary additional information. The following paragraphs guide the applicant to the relevant chapters of this document that describe the types of information that should be submitted. This discussion is organized around the five case examples described previously in this chapter. Since some sites will not fit neatly into this scheme, some interpolation may be necessary. Appendix B contains a chapter-by-chapter summary of this information.

Case 1

The information requirements for this case are applicable in all situations in which the permit applicant desires a direct health or environmental exposure level without accounting for mechanisms of attenuation. This method of setting the ACL is the standard for new units or for old units with no contamination at the time of permit issuance. If the applicant is dealing with a site that has ground-water contamination, the application must include a description of all plumes, including isopleth maps of all hazardous constituents in the ground water. All ACL demonstrations using allowable exposure levels must include the information necessary to select the appropriate POE level [Chapters IX and X] and information on the general ground-water use [Chapter VI]. If the constituents for which ACLs are requested do not have Agency-reviewed allowable dose or exposure levels, then additional information on human and/or environmental effects will be necessary. The type of information will be dependent on the potential receptors [Chapters IX and X]. A general description of the site and the types and characteristics of the wastes handled is also required [Chapter II]. General ground-water information is also necessary and includes: a description of the horizontal and vertical extent of the uppermost aquifer [Chapter III]; a description of the ground-water flow in the aquifer [Chapter IV]; and a listing of the background concentrations of all hazardous constituents in the aquifer. Most or all of this information should already be available in the permit application.

Case 2

If the facility has on-site ground-water contamination and the permit applicant desires to account for attenuation mechanisms then the ACL demonstration should include all of the information required in Case 1, in addition to the following: a description of the chemical and physical characteristics of the contaminants for which an ACL is requested [Chapter II]; data on the chemical-specific degradation or attenuation rates and/or processes [Chapter II]; a description of each soil type beneath the facility [Chapter III]; any other attenuation-related information, including soil properties [Chapter III]; description of the extent and hydrological properties of each local stratigraphic unit [Chapter III]; aquitard-related data [Chapter III]; if applicable, information on the temporal variations in ground-water flow and any withdrawal drawdown effects [Chapter IV]; if a mathematical simulation model is used, verification that it meets the criteria listed in Chapter IV; monthly precipitation data and effects on seasonal recharge [Chapter V]; any local ground-water discharge pathways [Chapter V]; location of each nearby (5 km) surface water body and an estimate of travel time for ground water from the facility to the water bodies [Chapter VI]; additional information on the current and projected demography and ground-water use when applicable [Chapter VI]; state certification of the ground- water's beneficial use [Chapter VII]; if background ground-water is contaminated, information on the sources and associated ground-water quality data [Chapter VIII]; and an assessment of the degradation of the ACL constituents, including degradation products and rates, when possible [Chapter XI]. It is very important that this information be synthesized to present a conservative attenuation argument.

Case 3

The required information for this case, where the contamination extends off-site and the ACL is based on attenuation mechanisms, is similar to that required for Case 2. However, because the contamination extends off-site, a more in-depth study of the human health and environmental effects will probably be necessary [Chapters IX and X].

Case 4

For this case, information will be necessary to demonstrate both that the proposed ACL is acceptable and that the contaminants allowed to attenuate into the surface water body will not cause any statistically significant increase in concentration in the surface water body. To do this, the demonstration must include the information required in the earlier cases (1, 2, and 3) in addition to the data necessary to show no statistical significance [Chapter X]. If a model is used, it should meet the requirements discussed at the end of Chapter IV. More specific data on the effects of storm events and flooding will also be necessary [Chapter V]. Additional information on the physical characteristics and discharge zone of each water body [Chapter VI] may also be necessary. The uses of these surface waters is also important information that should be documented [Chapter VII] along with a discussion of and data on other sources of surface water contamination [Chapter VII].

Case 5

The required information for this case includes the information specified for Cases 1, 2, and 3 as well as information demonstrating that any off-site contamination will not pose a threat to any potential receptor or degrade any beneficial use. Additional information pertaining to the hydraulic isolation of the uppermost aquifer [Chapter III], the possibility of exposure due to off-site contamination [Chapters VI and VII], the ultimate fate of the contaminants [Chapters II and XI], and the uses of local ground waters [Chapter VII] is also very important. Of course, background ground-water quality data demonstrating that the aquifer is nonpotable, and an assurance from the State that the ground water will not be used, is required.