Louisiana Department of Environmental Quality

Risk Evaluation/ Corrective Action Program (RECAP)

Prepared by:
Louisiana Department of Environmental Quality
Corrective Action Group

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Preamble

The Louisiana Department of Environmental Quality (LDEQ) has developed a Risk Evaluation/Corrective Action Program (RECAP) to address risks to human health and the environment posed by the release of chemical constituents to the environment. This is LDEQ's primary statutory mandate for remediation activities. It is clear in Louisiana's Environmental Quality Act that risk to human health and the environment must be evaluated in the remedial decision-making process.

RECAP uses risk evaluation to: (1) determine if corrective action is necessary for the protection of human health and the environment, and (2) identify constituent levels in impacted media that do not pose unacceptable risks to human health or the environment, i.e., RECAP Standards.

RECAP consists of a tiered framework composed of a Screening Option and three Management Options. This tiered approach allows site evaluation and corrective action efforts to be tailored to site conditions and risks. As the Management Option level increases, the approach becomes more site-specific and, hence, the level of effort required to meet the objectives of the Option increases. Although the level of effort required for each Option varies, each Option achieves a common goal: protection of human health and the environment.

There are numerous reasons for establishing RECAP; chief among them is the necessity to ensure that risks are properly evaluated to protect human health and the environment. Absent the establishment of such a program, the Department will expend considerably more resources to ensure that risk is evaluated properly, the regulated community will not have a clear understanding of the Department's requirements, and the general public will be uncertain as to the criteria used by the Department for remedial decisions.

In addition, LDEQ finds it necessary to establish clear and consistent guidelines across media-based program lines for the remediation of releases to air, land, and water. RECAP will ensure that remediation standards are developed consistently, that all parties are treated equally, and that risk to human health and the environment is the primary consideration when remedial decisions are made.

RECAP is consistent with the Environmental Protection Agency's (EPA) guidance on risk assessment. However, RECAP establishes policy decisions for the State of Louisiana that are left open to interpretation in EPA guidance. These policy issues include appropriate risk level, exposure concentration, groundwater use, land use, points of exposure, and points of compliance. The written establishment of the Department's position on these issues will reduce transaction costs, not only for the regulated community, but also the Department. In addition, by clearly establishing the submittal requirements for a risk evaluation, LDEQ will be able to ensure that all documents received contain the information required for remedial decision making. The RECAP regulation serves as LDEQ's policy statement on the performance of risk evaluations to determine if corrective action is warranted and the level of remediation required.

Without the RECAP regulation, risk evaluation would not be performed consistently in Louisiana.

The Louisiana Legislature mandated in La. R.S. 30:2272 (Act 1092 of the 1995 Regular Session) that LDEQ develop Minimum Remediation Standards. The RECAP regulation is the Department's response to that mandate. RECAP's tiered approach to risk evaluation and corrective action establishes not only across the board numerical standards for most media, but also allows for the development of more site-specific numerical standards when warranted.

The difficulty in identifying appropriate remedial criteria has been an additional driving force behind the development of this program. Often, regardless of the resources spent, remediating to pristine conditions has been unachievable and risk is not reduced. The time and effort expended in making these sometimes futile efforts can be better spent on projects that provide greater reduction in risk to human health and the environment. RECAP regulation will assist the Department in prioritizing sites that require remediation. As a result, LDEQ remediation staff will better focus their efforts on sites posing the greatest risk.

The RECAP regulation was initially promulgated on December 20, 1998. The regulation was revised through rulemaking in June 2000. This is the third revision of RECAP. It is expected that the RECAP regulation will be revised through rulemaking on an as-needed basis to incorporate changes in the science of risk evaluation and revisions to toxicological data. Such revisions will also allow the Department to modify the regulation based on its work experience.

Additional regulations regarding issues such as scope and applicability of the RECAP regulation may be found in LAC 33:I.Chapter 13. We also encourage the use of our RECAP web site located at www.deq.state.la.us/technology/recap/ to assist you in the interpretation and application of the regulation. Technical questions regarding the RECAP regulation should be directed to LDEQ's Office of Environmental Assessment at (225) 219-3236 or may be directed to contact persons listed on our RECAP web site via email or telephone.

All requests for copies of this document should be directed to the Regulation Development Section (RDS) of the LDEQ. The RDS may be contacted as follows:

Office of Environmental Assessment
Environmental Planning Division
Regulation Development Section
Post Office Box 4314
Baton Rouge, Louisiana 70821-4314
(225) 219-3550

The document is also available on the Internet on LDEQ's home page at:

http://www.deq.state.la.us/technology/recap/

Thank you for your interest in LDEQ's Risk Evaluation/Corrective Action Program.

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1.0 INTRODUCTION

This document presents the LDEQ Risk Evaluation/Corrective Action Program (RECAP) for addressing present and past uncontrolled constituent releases. It does not replace or supersede the Department's enforcement or permitting authority, notification requirements, or other applicable regulations. It does not replace or supersede the Hazardous and Solid Waste Amendments (HSWA) reporting requirements pertaining to newly discovered hazardous waste, hazardous constituents, or releases from Solid Waste Management Units at sites regulated under the Resource Conservation and Recovery Act (RCRA). It does not replace or supersede the Louisiana Department of Health and Hospitals, Office of Public Health's (LDHH/OPH) enforcement authority or evaluation of environmental situations where public health may be at risk. When warranted, the LDEQ, LDHH/OPH, and/or other appropriate state or federal agencies will work together to arrive at risk management decisions that are protective of human health and the environment. When warranted for the implementation of the Voluntary Cleanup Program, a partial remedial action plan may be approved in accordance with La.R.S.30:2286. This program does not preclude emergency response or interim measures necessary to protect human health and the environment and/or to prevent significant migration of constituents. It does not authorize any injury to private or public property (refer to Section 2.20) or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations, and does not authorize the migration of COC offsite to adjacent property. It is the responsibility of the Submitter to ensure that all exposure conditions and risks to human health and the environment are addressed and that decisions concerning management of the release site are protective of human health and the environment. The RECAP is designed for the management of typical chemical release sites. Variance from the requirements set forth in this program may be required/granted if deemed necessary by the LDEQ to prevent risks to human health or the environment posed by unique site conditions. The RECAP regulation is revised through rulemaking on an as-needed basis to incorporate recent advances in environmental science and to improve the overall effectiveness of the program based on past implementation experiences of the Department and regulated community. It will be necessary for releases currently being regulated under RECAP (June 20, 2000) to transition to compliance with RECAP (2003). Unless otherwise approved by the Department, an Area of Concern (AOC) currently being regulated under RECAP (June 20, 2000) may continue to comply with RECAP (June 20, 2000) until the current task/phase of the assessment has been completed and approved by the Department. Further assessment of the AOC shall be conducted in accordance with the requirements set forth in RECAP (2003) unless otherwise approved by the Department to be conducted in accordance with a prior promulgated version of RECAP.

1.1 Overview of LDEQ's Risk Evaluation/Corrective Action Program

The LDEQ RECAP consists of a tiered framework comprised of a Screening Option (SO) and three Management Options (MO) (Figure 1). The SO may be used to: (1) manage an AOC expeditiously; or (2) determine if an AOC warrants further evaluation under the

RECAP and, if warranted, to identify the Area of Investigation (AOI) and the Constituent(s) of Concern (COC) for evaluation under the RECAP. The tiered Management Options allow site evaluation and corrective action efforts to be tailored to site conditions and risks. As the MO level increases, the approach becomes more site-specific and hence, the level of effort required to meet the objectives of the Option increases. Although the level of effort required for each Option varies, each Option achieves a common goal: protection of human health and the environment. The goal of RECAP is to reduce risks to human health and the environment associated with constituents present at or migrating from a current or historical uncontrolled release to acceptable levels (i.e., insignificant) as defined by EPA guidance. The provisions of each Option are briefly described below.

1.1.1 Screening Option

The Screening Option provides Department-derived Screening Standards (SS) for soil and groundwater for non-industrial (residential) and industrial land use scenarios. The SS represent constituent concentrations in media that are protective of human health and the environment. The SS may be used to: (1) demonstrate an AOC does not pose a threat to human health or the environment and, hence, does not require further action at this time; (2) identify the AOI and COC for management of an AOC under the SO; or (3) determine if an AOC warrants further evaluation under RECAP, and if further evaluation is warranted to identify the AOI and COC in accordance with Section 2.6. To screen an AOC, the maximum concentration detected for each constituent in soil and groundwater shall be compared to the limiting SS. The maximum concentration used in the screening process shall be representative of the most heavily impacted area(s) known or suspected to be present within the AOC. Identification of the most heavily impacted area(s) is subject to concurrence by the Department. If the maximum constituent concentration(s) detected at the AOC is less than or equal to the limiting SS, then typically, no further action at this time (NFA-ATT) is required. The screening step may be used to expeditiously document that an AOC does not pose a threat to human health or the environment and that it does not warrant further evaluation/action. The SS may also be used to screen out areas of a facility, media, or COC that do not warrant further evaluation so that the scope of the RECAP evaluation can be limited to those areas/media/constituents most likely to be of concern. If the maximum constituent concentration(s) detected in soil and/or groundwater at the AOC exceeds the SS, then: (1) the AOI shall be managed under the SO; or (2) the AOI shall be evaluated under MO-1, MO-2, or MO-3.

1.1.2 Management Option 1

Management Option 1 (MO-1) provides Department-derived RECAP Standards (RS) for soil and groundwater. The MO-1 RS represent constituent concentrations in media that are protective of human health and the environment. The MO-1 RS were derived for non-industrial (residential) and industrial land use scenarios using currently recommended default exposure parameters and toxicity criteria issued by the EPA. Management Option 1 may be used to: (1) document that an AOI does not pose a threat to human health or the environment and hence, does not warrant further action at this time; (2) expeditiously manage an AOI defined by the presence of low constituent concentrations and standard exposure conditions; and/or (3) identify areas of a facility, media, or COC that warrant further evaluation so that the scope of the Management Option 2 (MO-2) or Management Option 3 (MO-3) evaluation can be limited to those areas/media/constituents most likely to pose risk. The soil AOI concentration (AOIC) and/or groundwater compliance concentration (CC) shall be compared to the MO-1 limiting RS. If the soil AOIC and groundwater CC for all COC are less than or equal to MO-1 limiting RS, then typically, NFA-ATT is required for soil or groundwater. If a constituent-specific soil AOIC or groundwater CC exceeds a MO-1 limiting RS, then the Submitter may: (1) remediate to the MO-1 limiting RS and comply with closure and/or post-closure requirements for MO-1; or (2) proceed with a MO-2 or MO-3 evaluation. The Submitter may elect to skip MO-1 and proceed directly to MO-2 or MO-3. If soil and/or groundwater do not meet the criteria for management under MO-1, the Submitter shall address these media under MO-2 or MO-3.

1.1.3 Management Option 2

Management Option 2 provides for the development of soil and groundwater RS using site-specific data with specified analytical models to evaluate constituent fate and transport at the AOI. The results of this site-specific evaluation shall be used in conjunction with currently recommended default exposure assumptions and toxicity criteria to identify site-specific MO-2 RS. The MO-2 RS represent constituent concentrations in media that are protective of human health and the environment under site-specific conditions. The soil AOIC and/or groundwater CC shall be compared to the site-specific MO-2 limiting RS. If the soil AOIC and groundwater CC for all COC are less than or equal to the site-specific MO-2 limiting RS, then typically, NFA-ATT is required for soil or groundwater. If a constituent-specific soil AOIC or groundwater CC exceeds a MO-2 limiting RS, the Submitter may: (1) remediate to the MO-2 limiting RS and comply with closure requirements for MO-2 (and post-closure requirements if warranted); or (2) proceed with a MO-3 evaluation. The Submitter may elect to skip MO-2 and proceed directly to MO-3. If soil or groundwater does not meet the criteria for management under MO-2, the Submitter shall address these media under MO-3.

1.1.4 Management Option 3

Management Option 3 provides for the development of site-specific RS for all impacted media using site-specific exposure and environmental fate and transport data. The site-specific MO-3 limiting RS represent constituent concentrations in media that are protective of human health and the environment under site-specific conditions. The AOIC and/or groundwater CC shall be compared to the site-specific MO-3 RS. If the AOIC and groundwater CC detected at the AOI are less than or equal to the MO-3 limiting RS, then typically, NFA-ATT is required. If a constituent-specific AOIC or groundwater CC for a COC exceeds a MO-3 limiting RS, then: (1) the AOI shall be remediated to the MO-3 RS; (2) confirmatory sampling shall be conducted; and (3) closure and/or post-closure requirements shall be met. In general, MO-3 requires additional site evaluation, a more extensive exposure assessment, and the application of more sophisticated fate and transport models. However, it should be noted that the complexity and scope of MO-3 are dictated by the complexity of the AOI conditions and exposure scenarios.

The Submitter may choose which Option (SO, MO-1, MO-2, or MO-3) an AOC or an AOI is managed under as long as the conditions of the AOC or the AOI meet the criteria for the Option chosen. Non-contiguous AOI at a facility may be managed under different Options. For example, MO-1 may be used to manage areas of a facility that are minimally impacted while MO-2 or MO-3 may be used to manage the more heavily impacted areas. Different media within an AOI may also be managed under different Options. For example: (1) heavily impacted soils may be managed under MO-2 or MO-3, while minimally impacted groundwater may be managed under MO-1; and (2) surface soil may be managed under MO-1, while soil impacted with a volatile COC located beneath an enclosed structure may be managed under MO-2 or MO-3. Different COC within a medium may also be managed under different Options.

An overview of the LDEQ RECAP framework is illustrated in Figure 1. The relationship between the SS, MO-1 RS, MO-2 RS, and MO-3 RS is illustrated in Figure 2. Each of the Options is discussed in detail in the following sections.

1.2 Use of LDEQ's Risk Evaluation/Corrective Action Program

The LDEQ RECAP may be used by a Submitter as discussed in the following sections.

1.2.1 A Submitter Seeking a No Further Action At This Time Determination for an AOC or an AOI

Under the RECAP, a NFA-ATT determination may be granted at a site where: (1) the source of the release has been removed or mitigated; (2) it has been adequately demonstrated that the site does not pose a risk to human health or the environment, (i.e., AOIC and CC present at the site are less than or equal to the limiting SS, MO-1 RS, MO-2 RS, or MO-3 RS); (3) the property remains suitable for commerce and residual constituent concentrations are appropriate for the intended future use of the land; and (4) sufficient financial assurance and/or financial commitment is provided when deemed appropriate by the Department under MO-3.

1.2.2 A Submitter Seeking a Certification of Completion Under R.S. 30:2287.1 for an AOI

The Secretary shall certify completion of remedial actions taken under a voluntary remedial action plan, which has been approved under La. R.S. 30:2286 (and regulations promulgated pursuant thereto), when the Submitter has adequately demonstrated that the site does not pose a risk to human health or the environment for the proposed development/use of the land (i.e., constituent concentrations present at the AOI are less than or equal to the limiting SS, MO-1 RS, MO-2 RS, or MO-3 RS which constitute the minimum remediation standards under R.S. 30:2272.1).

1.2.3 A Submitter Seeking Approval of a Corrective Action Plan for an AOI

Where it is warranted that risks to human health and the environment be evaluated, a site seeking approval of a corrective action plan (CAP) may use the RECAP to demonstrate that the corrective measures proposed at the AOI: (1) are adequate to protect human health and the environment (i.e., constituent concentrations reaching potential receptors and receiving media are less than or equal to the limiting SS, MO-1 RS, MO-2 RS, or MO-3 RS); and (2) will achieve acceptable constituent concentrations in a timeframe that is acceptable to the Department. Financial assurance and/or financial commitment shall be provided by the Submitter as deemed appropriate by the Department under MO-3.

1.2.4 A Submitter Seeking Approval of a Closure Plan for a Waste Management Unit for an AOI

RECAP may be used to support a closure plan for a Waste Management Unit where: (1) all applicable regulations are being addressed in the closure plan; and (2) it is warranted that risks to human health and the environment be evaluated. When deemed appropriate by the Department, a site seeking approval of a closure plan for a Waste Management Unit may use the RECAP in conjunction with applicable regulations to demonstrate that: (1) the proposed corrective measures are adequate to prevent a constituent from reaching potential receptors and/or receiving media at concentrations that are greater than the limiting SS, MO-1 RS, MO-2 RS, or MO-3 RS; and/or (2) residual constituent concentrations at or migrating from the site are less than or equal to the limiting SS, MO-1 RS, MO-2 RS, or MO-3 RS. Financial assurance and/or financial commitment shall be provided when deemed appropriate by the Department under MO-3. Clean closure of a Waste Management Unit (as defined in *Risk-Based Clean Closure*, EPA 1998) may be accomplished if: (1) all waste, waste residues, and containment system components have been removed from the Waste Management Unit; (2) the residual constituent concentrations in environmental media are less than or equal to the applicable SS, MO-1 RS, MO-2 RS, or MO-3 RS; and (3) the residual constituent concentrations in environmental media do not pose an unacceptable risk to ecological receptors.

1.3 Document Organization

Section 2.0, General Guidelines defines the terms used within the Program and provides guidance for key components of the Program including a site ranking system, site evaluation requirements, data quality assurance/quality control requirements, data evaluation and data usability, identification of the AOI and the COC, exposure assessment, estimation of the AOIC and groundwater CC, land use definitions, groundwater/aquifer use classifications, point of exposure/point of compliance for groundwater, descriptions of the Screening Standards and RECAP Standards, monitored natural attenuation, identification of background concentrations, acceptable risk levels, identification of toxicity values, institutional controls, self-implementation, demonstration of compliance with RS, and notification requirements. These guidelines apply to the management of sites under all of the Options.

Section 3.0, Screening Option presents an overview of the screening process; a listing of data requirements for the SO, criteria for the management of soil and groundwater under the SO, and guidelines on the identification and application of the SS; and the submittal requirements for the Screening Option.

Section 4.0, Management Option 1 presents an overview of MO-1; a listing of data requirements for MO-1 and the criteria for the management of soil and groundwater under MO-1; guidance on the use of the MO-1 RS as action standards and corrective action standards; and the MO-1 submittal requirements.

Section 5.0, Management Option 2 presents an overview of MO-2; a listing of data requirements for MO-2 and the criteria for management of soil and groundwater under MO-2; guidance on the use of the MO-2 RS as action standards and corrective action standards; and the MO-2 submittal requirements.

Section 6.0, Management Option 3 presents an overview of MO-3. It includes a listing of the data requirements for MO-3 and the criteria for management of an AOI under MO-3; guidance on the development of a workplan; guidance on conducting a site-specific exposure assessment for the development of MO-3 RS; guidance on the application of MO-3 RS; guidance on the identification of alternate RS when it is technically/economically not feasible to meet MO-3 risk-based RECAP Standards; and submittal requirements for MO-3.

Section 7.0, Ecological Risk Assessment provides guidance on conducting ecological risk assessments under the RECAP.

Section 8.0, Soil Re-Use Under the LDEQ RECAP addresses issues related to the re-use of soil under the RECAP. Guidelines for the re-use of soil on-site and off-site are presented.

Appendix A, Site Ranking Example presents an example for ranking a site for the RECAP.

Appendix B, RECAP Site Investigation Requirements presents the site investigation requirements for the RECAP.

Appendix C, RECAP Forms contains Submittal Summary (RECAP Form 1), Analytical Data Summary (RECAP Form 2), Analytical Data Evaluation (RECAP Form 3), Sampling Information Summary (RECAP Form 4), Groundwater Monitoring Well Characteristics (RECAP Form 5), Groundwater Monitoring Well Sampling Event Summary (RECAP Form 6), Site-Specific Environmental Fate and Transport Data Summary (RECAP Form 7), Chemical-Specific Data Summary (Form 8), Management Option 3 Site-Specific Exposure Data Summary (Form 9), Screening Option Summary for Soil (RECAP Form 10), Management Option 1 Summary for Soil 0-15 ft bgs

(RECAP Form 11), Management Option 1 Summary for Soil >15 ft bgs (RECAP Form 12), Management Option 2 or 3 Summary for Soil 0-15 ft bgs (RECAP Form 13), Management Option 2 or 3 Summary for Soil >15 ft bgs (RECAP Form 14), Screening Option Summary for Groundwater (RECAP Form 15), Management Option 1 Summary for Groundwater (RECAP Form 16), Management Option 2 or 3 Summary for Groundwater (RECAP Form 17), and Ecological Checklist (RECAP Form 18).

Appendix D**, **Guidelines for Assessing: Petroleum Hydrocarbons, Polycyclic Aromatic Hydrocarbons, Lead, Polychlorinated Dibenzodoxins and Polychlorinated Dibenzofurans, and Non-Traditional and Parameters contains guidance on addressing Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH), lead, Polychlorinated Dibenzodioxins (PCDD) and Polychlorinated dibenzofurans (PCDF), and non-traditional constituents and parameters under the RECAP.

Appendix E, North American Industry Classification System presents the North American Industry Classification codes used in defining industrial and non-industrial land use under the RECAP.

Appendix F, Aquifer Tests presents methods for measuring or estimating maximum sustainable yield for aquifers under investigation.

Appendix G, Guidelines for Addressing Additive Health Effects Under the RECAP contains methods for addressing exposure to multiple constituents that elicit the same noncarcinogenic critical effects or affect the same target organ/system and includes a listing of the target organs/critical effects for the constituents presented in Tables 2 and 3.

Appendix H, Methods for the Development, Identification, and Application of Screening Standards and MO-1, MO-2, and MO-3 RECAP Standards presents the methods and assumptions for the development of the SS MO-1 RS, MO-2 RS, and MO-3 RS and guidelines for the identification and application of these Standards at the AOI.

Appendix I, A Site-Specific RECAP Evaluation for Typical UST Sites presents a site-specific RECAP evaluation for UST sites. It includes discussions on the types of sites that qualify for management under Appendix I; the identification and application of Appendix I RS; and Appendix I submittal requirements.

2.0 GENERAL GUIDELINES

This section includes RECAP terminology and provides guidance for key components of the RECAP. This guidance is applicable to the management of sites under the Screening Option and RECAP Management Options 1, 2, and 3.

2.1 Program Terminology

This section includes descriptions of terms that are **specific** to the RECAP.

10^{-6} - 10^{-6} is a shorthand description for an incremental or excess lifetime cancer risk of 0.000001 in 1 (i.e., 1 chance in a 1,000,000).

10^{-5} - 10^{-5} is a shorthand description for an incremental or excess lifetime cancer risk of 0.00001 in 1 (i.e., 1 chance in a 100,000).

10^{-4} - 10^{-4} is a shorthand description for an incremental or excess lifetime cancer risk of 0.0001 in 1 (i.e., 1 chance in a 10,000).

95 percent upper confidence limit - the upper limit of a 95 percent confidence interval for the mean; there is only a 5 percent probability that the true mean is greater than this value.

95%UCL-AM – **95** percent **u**pper **c**onfidence **l**imit on the **a**rithmetic **m**ean.

Acceptable risk - a cancer risk of 10^{-6} or less for the Screening Option, Management Option 1, and Management Option 2; a cancer risk less than or within the range of 10^{-6} to 10^{-4} for Management Option 3; a Hazard Index less than or equal to 0.1 for the Screening Option; a Hazard Index less than or equal to 1.0 for Management Option 1, Management Option 2, and Management Option 3 (refer to Section 2.14).

Action standard - the concentration of a specific COC that is defined as acceptable; COC concentrations less than or equal to the action standard do not typically require further action, COC concentrations above the action standard typically warrant further evaluation.

Acute - refers to an exposure of short duration, often refers to a single exposure event.

Additivity - the assumption that doses received from simultaneous exposure to several constituents from a variety of sources by more than one exposure pathway are additive. For carcinogens, simple dose additivity is assumed. For noncarcinogens, it is assumed that simultaneous subthreshold exposures to several constituents that elicit the same critical effect or affect the same target organ/system could result in an adverse health effect.

AOC - **a**rea **o**f **c**oncern.

AOI - **a**rea **o**f **i**nvestigation.

AOIC – **a**rea **o**f **i**nvestigation **c**oncentration.

Applicable or Relevant and Appropriate Requirements (ARAR) - applicable requirements are those clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site. Relevant and appropriate requirements are those clean-up standards which, while not applicable, at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the particular site. ARAR can be action-specific, location-specific, or constituent-specific. Examples of ARAR that may be considered acceptable for use under the RECAP include a Safe Drinking Water Act maximum contaminant level (MCL), maximum contaminant level goal (MCLG), and secondary drinking water standard; a federal ambient water quality criterion; a national ambient air quality standard (NAAQS); a Louisiana Water Quality Standard; and a Louisiana Air Quality Standard. The use of an ARAR under the RECAP is subject to Department approval.

Aquifer - a geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs (LAC 33:V.109).

ARAR - **A**pplicable or **R**elevant and **A**ppropriate **R**equirements.

Area of concern (AOC) - an area where constituents have been released to the environment or a waste management unit.

Area of investigation (AOI) - a zone contiguous to and including impacted media defined vertically and horizontally by the presence of one or more constituents in concentrations exceeding the limiting SS, MO-1 RS, or MO-2 RS (depending on the Option being implemented).

Area of investigation concentration (AOIC) – (1) the concentration of the COC in the environmental or biological medium to which the receptor is exposed or may be exposed in the future; and/or (2) the concentration of the COC in an environmental medium that may serve as a source for constituent transport and/or transfer to another environmental medium (refer to Section 2.8).

Background concentration - concentration of constituents present in the environment that are distinguishable from an identifiable source concentration (refer to Section 2.13).

BCF - **b**io**c**oncentration **f**actor.

bgs - **b**elow **g**round **s**urface.

Bioconcentration factor (BCF) - a measure or an estimate of the extent of constituent partitioning at equilibrium between a biological medium such as fish tissue or plant tissue and an external medium such as water. The higher the BCF, the greater the accumulation of a constituent in living tissue is likely to be.

Biota - animals and plants likely to be consumed by humans.

C_a – acceptable constituent concentration in air for the evaluation of the vapor emissions from soil to an enclosed structure pathway, the vapor emissions from groundwater to an enclosed structure pathway, and the vapor emissions from groundwater to ambient air pathway.

C_{ai} – acceptable constituent concentration in air for the evaluation of the vapor emissions from soil to an enclosed structure pathway, the vapor emissions from groundwater to an enclosed structure pathway, and the vapor emissions from groundwater to ambient air pathway for industrial/commercial land use.

C_{ani} – acceptable constituent concentration in air for the evaluation of the vapor emissions from soil to an enclosed structure pathway, the vapor emissions from groundwater to an enclosed structure pathway, and the vapor emissions from groundwater to ambient air pathway for non-industrial land use.

Cancer risk - the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen.

CAP - **C**orrective **A**ction **P**lan.

Carcinogen - a cancer-causing agent; see EPA's Weight-of-Evidence Classification System.

CC – **c**ompliance **c**oncentration.

Chronic - pertaining to an exposure duration of seven years to a lifetime (70 years).

Closure - the act of securing and rendering harmless a site that has been used to store, treat, or dispose of a hazardous or solid waste so that it will pose no significant threat to human health or the environment.

CLP - **C**ontract **L**aboratory **P**rogram.

COC - **C**onstituent(s) **o**f **C**oncern.

Compliance concentration (CC) - the COC concentration detected in groundwater at the point of compliance.

Conceptual site model (CSM) - a model of the site used to identify all potential or suspected sources of constituents, types and concentrations of COC detected at the site, potentially impacted media, and potential exposure pathways and receptors.

Constituents of concern (COC) - solid waste and hazardous waste, as defined in LAC 33:V.109; industrial solid waste as defined in LAC 33:VII.115; hazardous substance, as defined in La. R.S. 30:2272; regulated substance, as defined in LAC 33:XI.103; pollutant as defined in La. R.S. 30:2004; wastes as defined in La. R.S. 30:2073; and pollutant, priority pollutant, and toxic substances, as defined in LAC 33: IX.107.

Corrective action - activities conducted to protect human health and the environment.

Corrective action standard - term used within the meaning of the RECAP to prescribe concentrations of constituents in soil and groundwater above which remedial action shall take place or the concentrations to which impacted media shall be remedied.

Critical effect - the most sensitive health effect (the health effect observed at the Lowest Observable Adverse Effect Level) associated with exposure to the constituent of concern. The critical effect that serves as the basis of the RfD or RfC is the critical effect that should be identified for the purpose of adjusting RS to account for additive noncarcinogenic health effects.

CSM - **c**onceptual **s**ite **m**odel.

Cumulative risks - total cancer risks associated with exposure to multiple constituents and/or via multiple exposure pathways/media.

DAF - **d**ilution and **a**ttenuation **f**actor.

DAF2 – a MO-2 site-specific dilution and attenuation factor representative of the natural dilution and attenuation of constituent concentrations from the point of compliance to the point of exposure (nearest downgradient property boundary) (refer to Section 2.11 for guidance on establishing the POC and POE); applicable to $Soil_{GW2}$ and GW_2.

DAF3 – a MO-2 site-specific dilution and attenuation factor representative of natural dilution and attenuation of constituent concentrations from the point of compliance to the point of exposure (nearest downgradient surface water body) (refer to Section 2.11 for guidance on establishing the POC and POE); applicable to $Soil_{GW3}$ and GW_3.

Data evaluation - the assessment of the effect of quality control issues on data usability for risk assessment purposes.

Data quality objectives (DQO) - qualitative and quantitative statements established prior to data collection which specify the quality of data required to support decisions during remedial response activities.

Data validation - the evaluation of data generated in accordance with EPA's Contract Laboratory Program Statement of Work for organics and inorganics. The evaluation is conducted in accordance with EPA's laboratory data validation functional guidelines for organic and inorganic analyses and includes the identification of deviations from the Statement Of Work (SOW), poor Quality Control (QC) results, matrix interferences, and other analytical problems that compromise the potential uses of the data. In the validation process, data may be flagged with qualifiers to alert data users of deviations from QC requirements.

Detection limit (DL) - the lowest amount of a constituent that can be seen above the normal noise of an analytical instrument or method.

DF - **d**ilution **f**actor.

DF2 - a MO-1 default dilution factor representative of natural dilution of constituent concentrations from the point of compliance to the point of exposure (nearest downgradient property boundary) (refer to Section 2.11 for guidance on establishing the POC and POE); applicable to $Soil_{GW2}$ and GW_2.

DF3 - a MO-1 default dilution factor representative of natural dilution of constituent concentrations from the point of compliance to the point of exposure (nearest downgradient surface water body) (refer to Section 2.11 for guidance on establishing the POC and POE); applicable to $Soil_{GW3}$ and GW_3.

Dilution and attenuation factor (DAF) - the ratio of the concentration of a constituent (dissolved in water or contained in soil) to the concentration of the same constituent after natural attenuation has occurred.

Dilution factor (DF) - the ratio of the concentration of a COC dissolved in water to the concentration of the same constituent after mixing with constituent free water or less concentrated constituent laden water. The measurements of concentrations usually occur at two different spatial points (e.g., at the POC and at the POE).

Dose - the mass of a chemical substance to which a receptor is exposed [i.e., in contact with an exchange boundary per unit body weight per unit time (mg/kg-day)].

DOTD - **L**ouisiana **D**epartment of **T**ransportation and **D**evelopment.

Downgradient - in the direction of groundwater flow. Groundwater flow is from areas of high hydraulic head to areas of low hydraulic head.

DQO - **D**ata **Q**uality **O**bjectives.

Ecological risk assessment - an assessment that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors. It is a process for organizing and analyzing data, information, assumptions, and uncertainties to evaluate the likelihood of adverse ecological effects.

Enclosed structure - an occupied (or potentially occupied) [i.e., one or more receptors spend a significant portion of the day (or workday) within the enclosed structure] structure on a slab foundation that has a roof and walls on all sides which prevent the free exchange of indoor air with outdoor (ambient) air.

Exposure - contact of an organism with a COC (chemical, metal etc.).

Exposure assessment - an appraisal of the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways by which humans are potentially exposed.

Exposure medium - any environmental medium that may serve as a source of exposure of human or ecological receptors to one or more constituents of concern via current and/or future exposure pathways.

Exposure parameters - variables used in the calculation of intake (e.g., exposure duration, inhalation rate, body weight).

Exposure pathway - the course a constituent or physical agent takes from a source to an exposed organism. An exposure pathway describes a unique mechanism by which an individual or population is exposed to constituents or physical agents at or originating from a site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, a transport/exposure medium (e.g., air) or media (in cases of intermedia transfer) also is included.

Exposure point - a location of actual or potential contact between an organism and a constituent or physical agent.

Exposure route - the way a constituent or physical agent comes in contact with an organism (e.g., by ingestion, inhalation, and/or dermal contact).

Facility - all contiguous land and structures, other appurtenances, and improvements on the land used for the processing, treating, storing, or disposing of COC. A facility may consist of one or more treatment, storage, disposal operational units (e.g., one or more landfills, surface impoundments, etc.), and areas of investigation or sites.

f_{oc} - **f**ractional **o**rganic **c**arbon in soil or sediment.

Groundwater - water located beneath the ground surface or below a surface water body in a saturated zone or stratum.

Groundwater Classification 1 - ***Class 1A***: Groundwater within an aquifer or that has a direct hydraulic connection to an aquifer that currently supplies drinking water to a public water supply. A public water supply is defined as a water supply which provides water to the public and has a minimum of 15 service connections or regularly serves a minimum of 25 individuals daily at least 60 days out of the year (State of Louisiana Sanitary Code); or **Class 1B**: Groundwater within an aquifer that could potentially supply drinking water to a public water supply. The aquifer should be sufficiently permeable to transmit water to a well at a maximum sustainable yield of greater than or equal to 4,800 gallons per day (gpd) (6 households x 4 persons per household x 100 gpd x peaking factor of 2); **and** groundwater quality is such that it has a TDS concentration less than or equal to 1,000 milligrams per liter (mg/l). **NOTE:** (1) An aquifer meeting the Groundwater Classification 1 criteria is considered an underground source of drinking water and shall be protected or restored to its maximum beneficial use (residential use). (2) A water supply that serves greater than six households is considered to be a public water supply as it is assumed that the average household has four occupants. Each person in the household is considered to use 100 gallons of water per day (Louisiana Department of Health and Hospitals). To ensure that water is available on an as-needed basis, a peaking factor of two has been applied to the daily water consumption rate. Therefore, a value of 4,800 gpd has been established as the minimum sustainable yield for a potential public water supply. Refer to Figure 3 for an illustration of the groundwater classifications.

*Groundwater Classification 2 - **Class 2A***: Groundwater within an aquifer that currently supplies water to a domestic water supply, agricultural supply, or any other supply. A domestic water supply is defined as one which provides water to an individual household or households but is not considered to be a public water supply as defined in Groundwater Classification 1; or ***Class 2B***: Groundwater within an aquifer that could potentially supply drinking water to a domestic water supply. The aquifer should be sufficiently permeable to transmit water to a well at a maximum sustainable yield of greater than or equal to 800 gpd and less than 4,800 gpd (4 persons per household x 100 gpd x peaking factor of 2); **and** groundwater quality is such that it has a TDS concentration less than or equal to 1,000 mg/l; or ***Class 2C***: Groundwater within an aquifer that could potentially supply drinking water to a domestic water supply. The aquifer should be sufficiently permeable to transmit water to a well at a maximum sustainable yield of greater than or equal to 800 gpd; **and** groundwater quality is such that it has a TDS concentration greater than 1,000 mg/l and less than or equal to 10,000 mg/l. **NOTE:** (1) If a public water supply well is located within one mile of the site property boundaries and is screened in the same stratum as the aquifer of concern or has a direct hydraulic connection, then the aquifer shall be classified as a Groundwater Classification 1 aquifer. (2) It is assumed that the average household has four occupants and that each person in the household uses 100 gallons of water per day (Louisiana Department of Health and Hospitals). To ensure that water is available on an as-needed basis, a peaking factor of two has been applied to the daily water consumption rate. Therefore, a value of 800 gpd has been established as the minimum sustainable yield for a potential domestic water supply. (3) A yield of 800 gpd is approximately the median yield for an underground source of drinking water as defined by EPA (150-1440 gpd) (*Assistance on Compliance of 40 CFR Part 191 with Groundwater Protection Standards*, Memorandum, EPA, Office of Water, June 1993). Refer to Figure 3 for an illustration of the groundwater classifications.

*Groundwater Classification 3 - **Class 3A***: Groundwater within an aquifer that is sufficiently permeable to transmit water to a well at a maximum sustainable yield of less than 800 gpd; or ***Class 3B***: Groundwater quality is such that it has a TDS concentration greater than 10,000 mg/l. **NOTE:** If a domestic or agricultural water supply well is located within one mile of the site property boundaries and is screened in the same stratum as the aquifer of concern or has a direct hydraulic connection, then the aquifer shall be classified as a Groundwater Classification 2 aquifer. For groundwater in communication with a surface water body, groundwater shall be classified as surface water at the point of discharge to the surface water body. Refer to Figure 3 for an illustration of the groundwater classifications.

Groundwater plume - groundwater defined vertically and horizontally by the presence of a COC at concentrations greater than the limiting groundwater standard for the Option being implemented; the groundwater AOI.

GW_{air} - the RECAP standard for volatile emissions from **g**round**w**ater to the ambient **air**.

GW_1 - the RECAP standard for groundwater meeting the definition of **G**round**w**ater Classification **1**.

GW_2 - the RECAP standard for groundwater meeting the definition of **G**round**w**ater Classification **2**.

GW_3 - the RECAP standard for groundwater meeting the definition of **G**round**w**ater Classification **3**.

GW_{3DW} - the RECAP standard for groundwater meeting the definition of **G**round**w**ater Classification **3** that may potentially discharge to a downgradient surface water body (segment or subsegment) that is classified as a **d**rinking **w**ater source. The objective of the GW_{3DW} RECAP standard is to provide protection against the migration and discharge of a COC via groundwater to a surface water body. It is not the intent of this standard to allow the discharge of a COC to surface water.

GW_{3NDW} - the RECAP standard for groundwater meeting the definition of **G**round**w**ater Classification **3** that may potentially discharge to a downgradient surface water body (segment or subsegment) that is classified as a **n**on-**d**rinking **w**ater source. The objective of the GW_{3NDW} RECAP standard is to provide protection against the migration and discharge of a COC via groundwater to a surface water body. It is not the intent of this standard to allow the discharge of a COC to surface water.

GW_{es} - the RECAP standard for **g**round**w**ater impacted with volatile constituents located beneath an **e**nclosed **s**tructure, applies to Management Options 1, 2, and 3.

GW_{SS} - is the RECAP **s**creening **s**tandard for groundwater. The GW_{SS} is applicable to groundwater meeting the definitions of **G**round**w**ater Classifications 1, 2, and 3.

Hazard index (HI) - the sum of more than one hazard quotient for multiple noncarcinogens (that elicit the same critical effect or affect the same target organ/system) and/or multiple exposure pathways.

Hazard quotient (HQ) - the ratio of the AOIC for a single noncarcinogenic COC to the SS or RS for that COC.

HEAST - **H**ealth **E**ffects **A**ssessment **S**ummary **T**ables is a document published annually by the EPA that contains reference doses and cancer slope factors.

Henry's Law Constant - provides a measure of the extent of constituent partitioning between air and water at equilibrium. The higher the Henry's Law constant, the more likely a constituent is to volatilize to air than to remain in the water.

HI - **H**azard **I**ndex.

High fugitive dust emissions – the release of a high concentration of soil particulates to the ambient air due to the presence of dry soil (moisture content less than 8 percent), finely divided or dusty soils (high silt or clay content), high average annual wind speeds (greater than 5.3 m/sec), less than 50 percent vegetative cover, heavy traffic on unpaved roads, and/or soil intrusive activities.

HQ - **H**azard **Q**uotient.

Hydraulic conductivity - or "coefficient of permeability" is a measure of the capacity of a porous medium to transmit water. It is defined as the volume of water that will move in a unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. The dimensions of hydraulic conductivity are length per time or velocity. Hydraulic conductivity is governed by the size and the shape of the pores, the effectiveness of the interconnection between pores, roughness of mineral particles, degree of soil saturation, and the physical properties of the fluid.

Impact - the presence of a constituent at a concentration which exceeds the limiting standard applicable at the AOC or the AOI for the Option being implemented.

Industrial/commercial - any property not currently used for human habitation on a permanent or temporary/intermittent basis having the following North American Industry Classification System (NAICS) (See Appendix E) major group numbers 11-21; 22 (except 22131); 23-56 inclusive; 61 (except 61111, 61121, 61131); 62 (except 62211, 62221, 62231, 62311, 62322, 623311, 623312, 62399, 62411, and 62441); 71 (except 71219); 72 (except 721191, 721211 and 72131); 81 (except 81411); and 92 (except 92214). Industrial property shall include any block(s) or lot(s) of land controlled by the same owner or operator that are vacant land(s) found within or beside developed land(s). For leased lands, industrial property includes the leasehold and any containers, vessels, tanks, or any other contrivances or units that provide for the management of COC to or from the leasehold.

Inhalation unit risk – toxicity value which represents the cancer risk per mg of chemical per kg of body weight per day of exposure.

Injury - a wrong or damage done to a person or his or her property or rights when caused by the wrongful act of another.

Institutional controls - actions taken or modifications to a site that prevent or minimize contact with impacted media.

Integrated Risk Information System (IRIS) - an EPA database (http://www.epa.gov/iris/) containing verified reference doses and cancer slope factors and up-to-date health risk and EPA regulatory information for numerous constituents.

IRIS - **I**ntegrated **R**isk **I**nformation **S**ystem.

K_d - distribution coefficient defined by the product of the fraction of organic carbon in soil multiplied by the K_{oc} for the hydrophobic organic constituents. Although comparable algorithms are not available for estimating equilibrium partition coefficients for inorganic constituents, published values are available for metals (e.g., EPA 1996).

K_{oc} - organic carbon/water partition coefficient - provides a measure of the extent of constituent partitioning between organic carbon and water at equilibrium. The higher the K_{oc}, the more likely a constituent is to bind to carbon in soil or sediment than to remain in the water column.

K_{ow} - octanol/water partition coefficient - provides a measure of the extent of constituent partitioning between water and octanol at equilibrium. The greater the K_{ow} the more likely a constituent is to partition to octanol than to remain in water. Octanol is used as a surrogate for lipids (fat), and K_{ow} can be used to predict bioconcentration in aquatic organisms.

Lifetime - the default average human lifetime which is assumed to be 70 years (EPA).

Limiting RECAP Standard (LRS) - the lowest standard of all the standards that are applicable to a given exposure or source medium.

LRS – **L**imiting **R**ECAP **S**tandard.

LSS – **L**imiting **S**creening **S**tandard.

Limiting Screening Standard (LSS) - the lowest screening standard of all the standards that are applicable to a given medium.

Management Option 1 (MO-1) - provides Department-derived RECAP Standards (RS) for soil and groundwater. MO-1 RS identify constituent concentrations in media that are protective of human health and the environment. MO-1 RS were derived for non-industrial (residential) and industrial exposure scenarios using currently recommended default exposure parameters and toxicity criteria.

Management Option 2 (MO-2) - provides the option of using site-specific data with specified analytical models to evaluate constituent fate and transport at the site. The results of this site-specific evaluation shall be used in conjunction with standard reasonable maximum exposure (RME) assumptions to identify site-specific MO-2 RS.

Management Option 3 (MO-3) - provides the option of using site-specific data for the evaluation of exposure and environmental fate and transport for the development of site-specific MO-3 RS.

Maximum Contaminant Level (MCL) - the maximum permissible concentration of a contaminant in water which is delivered to any user of a public water system. The MCL is contained in the National Primary Drinking Water Regulations (40 CFR 141).

MCL - **M**aximum **C**ontaminant **L**evel.

Media of concern - any currently impacted media to which individuals may be exposed or through which constituents may be transported to potential receptors.

MO-1 - **M**anagement **O**ption **1**.

MO-2 - **M**anagement **O**ption **2**.

MO-3 - **M**anagement **O**ption **3**.

Monitored natural attenuation (MNA) - the monitored biodegradation, dispersion, dilution, sorption, volatilization, and/or chemical and biochemical transformation/stabilization of constituents to effectively reduce constituent concentration, toxicity, mobility, mass or volume to levels that are protective of human health and the ecosystem. Also referred to as intrinsic remediation or passive remediation.

NAPL **-** **n**on-**a**queous **p**hase **l**iquid.

NFA-ATT - **n**o **f**urther **a**ction **a**t **t**his **t**ime.

Non-Aqueous Phase Liquid (NAPL) - a liquid not dissolved in water, commonly referred to as "free product."

Noncarcinogen - an agent that is known not to cause cancer.

Non-detect - a constituent that is not detected in a particular sample above a certain limit, usually the quantitation limit for the constituent in that sample.

Non-industrial - any property that does not meet the exclusive definition of an industrial property (see Appendix E). Such properties may be residential, farming (livestock or vegetative), or undeveloped lands that are not included in the industrial property description (privately-owned lands, wetlands, state and national parks). Non-industrial sites shall be managed through comparison with non-industrial standards and/or remediated to non-industrial standards.

Particulate emission factor (PEF) - relates the COC concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from impacted surface soils at sites.

PAH - **p**olycyclic **a**romatic **h**ydrocarbon.

PCDD – **p**oly**c**hlorinated **d**ibenzo**d**ioxins.

PCDF – **p**oly**c**hlorinated **d**ibenzo**f**urans.

PEF - **p**articulate **e**mission **f**actor.

Permanent structure - a well established building or similar structure located in an area of established, controlled land use that is not anticipated to change in the future or the planned development of a well established building or similar structure in an area of established, controlled land use under the Voluntary Cleanup Program.

POC - **p**oint **o**f **c**ompliance.

POE - **p**oint **o**f **e**xposure.

Point of compliance (POC) - the point in groundwater where the RECAP standard must be met (refer to Section 2.11).

Point of exposure (POE) - a location of actual or potential contact between an organism and a chemical agent.

Post-remediation verification requirements - soil sampling and groundwater monitoring required to verify that remediated media meet the RS.

Post-closure requirements - monitoring, financial assurance, and/or institutional control requirements that shall be met after the closure of a site.

Preliminary evaluation - an initial investigation designed to determine if the release of a COC to the environment has occurred. This evaluation should include a review of any information available regarding the AOC, the results of an AOC inspection, and sample results from any media potentially impacted by a release. Preliminary evaluations may be conducted by a responsible party, an interested party, or by a regulatory agency. Examples of preliminary evaluations include Phase II real estate evaluations, State Site Assessments (SSA I and II) conducted by LDEQ under the Inactive and Abandoned Sites guidelines, or RCRA facility assessments (RFAs) conducted by LDEQ for the RCRA corrective action program.

QA/QC - **q**uality **a**ssurance/**q**uality **c**ontrol.

Quality assurance/quality control (QA/QC) - a system of procedures, checks, audits, and corrective actions used to ensure that field work and laboratory analysis meet certain established standards.

Quantitation limit (QL) - the lowest concentration at which a constituent can be accurately and reproducibly quantitated. Usually equal to the instrument detection limit multiplied by a factor of three to five, but varies for different constituents and different samples.

Reasonable maximum exposure (RME) - the highest exposure that could reasonably be expected to occur for a given exposure pathway at an AOI and is intended to account for both uncertainty in the COC concentration and variability in exposure parameters. Reasonable maximum exposure is estimated by combining a mean (95 percent UCL on the arithmetic mean) AOIC with protective exposure assumptions.

RECAP - **R**isk **E**valuation/**C**orrective **A**ction **P**rogram.

RECAP standard (RS) - a concentration of a constituent of concern in an environmental medium that defines an action standard or remediation standard depending on the Management Option and the application chosen.

Receptor - potentially exposed individual/population.

Reference concentration (RfC) - an estimate of a daily exposure level (i.e., COC concentration in air) for a human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime; expressed in units of mg/m^3; may be converted to a corresponding inhalation RfD (mg/kg-day) by dividing by 70 kg and multiplying by 20 m^3/day; EPA toxicity value for constituents that elicit noncarcinogenic health effects.

Reference dose (RfD) - an estimate of a daily exposure level for a human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime; expressed in units of mg/kg-day; EPA toxicity value for constituents that elicit noncarcinogenic health effects.

Regulated site - area of investigation that is subject to the requirements of this program.

Remediation - action or series of actions taken at a site to reduce, destroy, or otherwise mitigate the constituents present at the site.

Residential - non-industrial.

RfC - **r**e**f**erence **c**oncentration.

RfD - **r**e**f**erence **d**ose.

Risk assessment - is an analysis of the potential adverse health or environmental effects (current or future) associated with the presence of a constituent in an environmental medium.

Risk characterization - the description of the nature and the magnitude of human or ecological risk, including associated uncertainty.

RME - **r**easonable **m**aximum **e**xposure.

RS - **R**ECAP **S**tandard.

Sample quantitation limit (SQL) - the method quantitation limit multiplied by the dilution factor for the sample (if any). A quantitation limit that takes into account adjustments in the preparation and analytical method for any given sample.

Sampling bias - the condition in which a sample data set is comprised of an inordinate number of source, perimeter, or other samples such that the data set is not representative of true constituent distribution at the AOI.

SAS - **s**pecial **a**nalytical **s**ervices.

Screening Option (SO) - provides Department-derived Screening Standards (SS) for soil and groundwater for non-industrial (residential) and industrial land use scenarios. Screening Standards may be used to: (1) document that an AOC does not pose a threat to human health or the environment and, hence, does not require further action at this time; (2) identify the AOI and COC for management of the AOC under the SO; or (3) determine if an AOC warrants further evaluation under MO-1, MO-2, or MO-3, and if further evaluation is warranted, to identify the AOI and the COC in accordance with Section 2.6.

Screening Standard (SS) - a constituent concentration in medium used to: (1) determine if an AOC requires further evaluation; (2) identify the AOI; and (3) identify the COC for further evaluation under a MO.

S_d - the thickness of the impacted groundwater within the permeable zone. Refer to Figure H-1 in Appendix H for guidance on determining the S_d.

Sediment - solid fragments of inorganic and/or organic material that come from the weathering of rock and are carried and deposited by wind, water, and ice and has come to rest on the earth's surface at, above, or below sea level.

Segment or subsegment of a surface water body - surface water bodies are identified by the drainage basin in which they are located. Each water body has an identification code. Refer to LAC 33:IX.1123.

Sensitive subpopulation - receptors at increased risk from chemical exposures due to increased sensitivity, behavior patterns that may result in high exposure, and/or current or past exposures from other sources. Subpopulations that may be more sensitive to chemical exposures include infants and children, elderly people, pregnant and nursing women, and people with chronic illness. Those potentially at higher risk due to behavior patterns include children, who are more likely to contact soil, and persons who may eat large amounts of locally caught fish or locally grown produce. Subpopulations at higher risk due to exposures from other sources include individuals exposed to chemicals during occupational activities and individuals living in industrial areas.

SF - **s**lope **f**actor.

Site - the physical location, including land area(s) and appurtenances, defined by the extent of migration of the COC, or any area where a COC has been or may have been deposited, stored, disposed of, placed, or otherwise come to be located.

Site investigation - an in-depth investigation for the purposes of defining site characteristics, determining the nature, horizontal and vertical extent of contamination, predicting fate and transport of contaminants, identifying potential exposure pathways and receptors, and determining the need for corrective action. A human health and/or ecological risk evaluation of the results of the remedial investigation will be required in all cases in accordance with RECAP.

Site location name - a location, including any appurtenances thereto, which encompasses one or more AOC or AOI.

Site ranking - a qualitative evaluation of a site based on known or readily available information to identify the urgency of response actions including interim remedial actions and further information gathering.

Site-specific - activities, information, and data unique to a particular site.

Slope factor (SF) - a plausible upper-bound estimate of the probability of a carcinogenic response per unit intake of a constituent over a lifetime; EPA toxicity value for a constituent that elicits carcinogenic health effects.

SO - **S**creening **O**ption.

$Soil_{es}$ – the RECAP Standard applicable to soil impacted with volatile constituents located beneath an **e**nclosed **s**tructure; applicable to Management Options 1, 2, and 3.

$Soil_{GW1}$ - the RECAP Standard for the soil concentration protective of groundwater meeting the definition of **G**round**w**ater Classification **1** (see Section 2.10); applicable to surface soil and subsurface soil.

$Soil_{GW2}$ - the RECAP Standard for the soil concentration protective of groundwater meeting the definition of **G**round**w**ater Classification **2** (see Section 2.10); applicable to surface soil and subsurface soil.

$Soil_{GW3}$ - the RECAP Standard for the soil concentration protective of groundwater meeting the definition of **G**round**w**ater Classification **3** (see Section 2.10); applicable to surface soil and subsurface soil.

$Soil_{GW3DW}$ – the RECAP Standard for the soil concentration protective of groundwater meeting the definition of **G**round**w**ater Classification **3** (see Section 2.10) that may potentially discharge to a downgradient surface water body (segment or subsegment) that is classified as a **d**rinking **w**ater source; applicable to surface soil and subsurface soil.

$Soil_{GW3NDW}$ – the RECAP Standard for the soil concentration protective of groundwater meeting the definition of **G**round**w**ater Classification **3** (see Section 2.10) that may potentially discharge to a downgradient surface water body (segment or subsegment) that is classified as a **n**on-**d**rinking **w**ater source; applicable to surface soil and subsurface soil.

$Soil_{ni}$ - the RECAP Standard for the protection of human health; applicable to surface soil located in an area meeting the definition of **n**on-**i**ndustrial land use.

$Soil_{ni}$-PEF - the RECAP Standard for the protection of human health; applicable to surface soil located in an area meeting the definition of **n**on-**i**ndustrial land use that is characterized by high fugitive dust emissions.

$Soil_{i}$ - the RECAP Standard for the protection of human health; applicable to surface soil located in an area meeting the definition of **i**ndustrial land use.

$Soil_{ni}$-PEF - the RECAP Standard for the protection of human health; applicable to surface soil located in an area meeting the definition of **i**ndustrial land use that is characterized by high fugitive dust emissions.

Soil re-use - the re-use of soil that meets, or has been treated to meet, applicable RS.

$Soil_{sat}$ - soil **sat**uration concentration.

Soil saturation concentration ($Soil_{sat}$) - the concentration at which the pore spaces in the soil medium are saturated with a constituent of concern. $Soil_{sat}$ is applicable to surface soil and subsurface soil. $Soil_{sat}$ is applicable only for constituents that are liquid at ambient soil temperatures (i.e., those having a melting point less than or equal to 20°C).

$Soil_{SSni}$ - is the risk-based soil **s**creening **s**tandard based on the protection of human health for **n**on-**i**ndustrial land use. The $Soil_{SSni}$ is applicable to surface soil.

$Soil_{SSi}$ - is the risk-based soil **s**creening **s**tandard based on the protection of human health for **i**ndustrial/commercial land use. The $Soil_{SSi}$ is applicable to surface soil.

$Soil_{SSGW}$ - **s**creening **s**tandard for the soil concentration protective of **g**round**w**ater meeting the definitions of Groundwater Classifications 1, 2 and 3 (based on compliance with GW_{SS}). The $Soil_{SSGW}$ is applicable to surface soil and subsurface soil.

Solubility - the amount of a substance that dissolves in a given amount of water to produce a saturated solution. Aqueous concentrations in excess of solubility may indicate sorption onto suspended solids/sediments, the presence of solubilizing constituents such as solvents, or the presence of a non-aqueous phase liquid (NAPL).

Source medium - any environmental medium that is serving or may serve as a source for the transfer of constituents to another medium (e.g., soil that may leach constituents to groundwater).

Special analytical services - Non-standardized analyses conducted to meet requirements that cannot be met using routine analytical services such as shorter analytical turnaround time, lower detection limits, and analysis of non-standard matrices or non-standard constituents.

SPLP - **S**ynthetic **P**recipitation **L**eaching **P**rocedure (EPA SW846 Method 1312).

SQL - **s**ample **q**uantitation **l**imit.

Standard industrial exposure scenario - a reasonable maximum exposure scenario for standard industrial land use based on an exposure time of 8 hours/day, an exposure frequency of 250 days/year, and an exposure duration of 25 years.

Standard non-industrial exposure scenario - a reasonable maximum exposure scenario for standard residential land use based on an exposure time of 24 hours/day, an exposure frequency of 350 days/year, and an exposure duration of 30 years.

SS - **s**creening **s**tandard.

Submitter - an individual or group of individuals involved in the RECAP process including owners, operators, etc.

Subsurface soil - the soil interval present from 15 feet bgs to the depth of impact.

Surface soil - the soil interval present from ground surface to a depth of 15 feet bgs. If the depth of impact is less than 15 feet bgs, then the surface soil shall be defined as the interval present between ground surface and the depth of impact. Soil present from ground surface to a depth of 15 feet bgs is considered potentially accessible and thus, a potential source of exposure, based on the fact that future intrusive soil activities at the site may result in deeper soils being brought to the surface. A depth of 15 feet was selected based on considerations of technical practicability. Based on site-specific conditions, the Department may require, or the Submitter may request to divide the surface soil interval into two intervals: (1) ground surface to 3 feet bgs; and (2) 3 feet bgs to depth of impact.

Surface water - all lakes, bays, rivers, streams, springs, ponds, impounding reservoirs, wetlands, swamps, marshes, water sources, drainage systems, and other surface waters, natural or artificial, public or private, within the state or under its jurisdiction that are not a part of the treatment system allowed by state law, regulation, or permit. Ditches that are part of a treatment system shall not be considered surface water provided that the treatment system is monitored downstream of the impacted area for the COC under the terms of an LPDES permit. It is not required that surface water in communication with groundwater be classified as groundwater for the purposes of determining yield and TDS for the selection of an aquifer classification.

Target hazard quotient (THQ) - an acceptable hazard quotient that is combined with exposure and toxicity information to calculate a corresponding acceptable constituent concentration in an environmental medium.

Target risk (TR) - an acceptable cancer risk level that is combined with exposure and toxicity information to calculate a corresponding acceptable constituent concentration in an environmental medium.

TDS - **T**otal **D**issolved **S**olids.

Tentatively identified compounds (TIC) - compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Threshold effects - refers to noncarcinogenic health effects. For many noncarcinogens there is a range of exposures that exists from zero to some finite value that can be tolerated by the organism with essentially no chance of expression of adverse effects. The exposure level must exceed the upper bound of this tolerance range before effects are observed.

TIC - **T**entatively **I**dentified **C**ompounds.

Total carcinogenic risk - the incremental individual lifetime cancer risk for simultaneous exposure to more than one carcinogen and/or for more than one exposure pathway contributing to exposure of the same receptor (refer to Section 2.14).

Total dissolved solids (TDS) - the total concentration of dissolved solids in water that is determined by evaporating a quantity of filtered water at a low temperature (measured in mg/L).

Total hazard index – the sum of hazard quotients to assess simultaneous exposure to more than one noncarcinogen that elicits the same critical effect or affects the same target organ/system and/or for exposure via multiple exposure pathways.

Total petroleum hydrocarbons (TPH) - an estimate of the total amount of petroleum hydrocarbons in a sample that may represent sums of concentrations of a limited number of compounds, groups of compounds, or the entire range of petroleum hydrocarbons. It may contain compounds that are not derived from petroleum.

Toxicity assessment - an appraisal of the evidence regarding the potential for particular COC to cause adverse effects in exposed individuals and/or organisms. Toxicity assessment is generally accomplished in two steps: hazard identification and dose-response assessment.

Toxicity value - a numerical expression of a substance's dose-response relationship that is used in risk assessments. The most common toxicity values used are reference doses (for noncarcinogenic effects) and slope factors (for carcinogenic effects).

TPH - **t**otal **p**etroleum **h**ydrocarbons.

TPH fraction - the aliphatic and aromatic hydrocarbon fractions defined by the TPH Fraction and Indicator Approach (refer to Appendix D).

TPH-DRO - the range of extractable total petroleum hydrocarbon constituents used to represent the presence of diesel (C_{10}-C_{28}).

TPH-GRO - the range of purgeable total petroleum hydrocarbon constituents used to represent the presence of gasoline (C_6-C_{10}).

TPH mixture - the petroleum hydrocarbons comprising TPH-GRO, TPH-DRO, or TPH-ORO.

TPH-ORO - the range of extractable total petroleum hydrocarbon constituents used to represent the presence of oil (C_{28}-C_{35}).

UCL - **u**pper **c**onfidence **l**imit.

Upper confidence limit - the upper limit of an interval which has a certain probability of including the population mean.

Volatile - referring to a constituent that evaporates readily at normal temperature and pressure.

$Water_{sol}$ - water **sol**ubility.

Weight-of-evidence classification - EPA's Weight-of-Evidence Classification System for carcinogenicity is a classification system for characterizing the extent to which the available data indicate that an agent is a human carcinogen. Under this system, Group A carcinogens are described as human carcinogens; Group B1 carcinogens are described as probable human carcinogens, limited human data are available; B2 carcinogens are described as probable human carcinogens, sufficient evidence in animal and inadequate or no evidence in humans; Group C carcinogens are described as possible human carcinogens; Group D carcinogens are described as not classifiable as to human carcinogenicity; and Group E carcinogens are described as having evidence of noncarcinogenicity for humans.

Yield - rate of groundwater transmitted to a well; expressed in units of gal/day.

2.2 Site Ranking System

Site ranking shall serve to rank each AOI based upon the urgency of the response action required for the protection of human health and the environment. The RECAP submittal shall contain a site ranking section that includes a recommendation on the appropriate ranking for the AOI and a discussion on the site-specific factors and the criteria used to select the ranking. The ranking system is based on the system that is contained in *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM E 1739-95). A site-ranking example (modified from ASTM E 1739-95) is included in Appendix A. Each AOI shall be given a site classification ranking of 1, 2, 3, or 4 using the following criteria:

Ranking	Criteria
1	Immediate threat to human health, safety, or sensitive environmental receptors;
2	Short-term (0-2 years) threat to human health, safety, or sensitive environmental receptors;
3	Long-term (> 2 years) threat to human health, safety, or sensitive environmental receptors; or
4	No demonstrable long-term threat to human health, safety, or sensitive environmental receptors.

A thorough justification of the site ranking shall be included in the RECAP submittal and shall include consideration of all current and future receptors and exposure pathways. Recommendations for interim measures to raise the site ranking shall be included for any AOI with a ranking of 1 or 2.

2.3 Site Investigation Requirements

The site investigation requirements for the RECAP are presented in Appendix B. Deviations from these requirements may be granted by the Department if justified based on site-specific conditions. Any Department-approved deviation from the requirements presented in Appendix B shall be outlined and summarized in the cover letter attached to the site investigation report. It is strongly recommended that a site investigation workplan be submitted to the Department for approval prior to the implementation of site investigation activities. Refer to Section B.2.4 of Appendix B for guidelines on developing a RECAP site investigation workplan.

2.4 Data Quality Assurance/Quality Control Requirements

Data Quality Assurance/Quality Control (QA/QC) is critical to the acquisition of reliable data for quantitative risk assessment. Data on which risk-based decisions are made must meet minimum analytical requirements and be of known quality to allow for an evaluation of uncertainty in the data and the resulting impact on estimated risks. Therefore, data used in the RECAP shall be obtained from a laboratory accredited by the State of Louisiana (http://www.deq.state.la.us/laboratory/apps.asp) (or a laboratory exempt from accreditation) and shall meet the following requirements:

(1) The data were generated using rigorous analytical methods such as an approved EPA method;

(2) The data are analyte-specific and the identity and concentration are confirmed;

(3) The method produced tangible raw data (e.g. chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files; and

(4) QA/QC documentation includes:

(a) sample documentation,

(b) initial and continuing calibration,

(c) determination and documentation of detection limits,

(d) analyte identification and quantification,

(e) QC blanks (trip, method, rinsate),

(f) matrix spike recoveries,

(g) performance evaluation samples (external QA or laboratory control samples; performance evaluation samples are samples that are analyzed by the laboratory in which a known amount of chemical is present in the sample and the results of the analysis are compared to the known amount of chemical to evaluate the performance of the analysis by the laboratory),

(h) analytical error determination (measures precision of analytical method; analytical error can be determined with replicate samples), and

(i) total measurement error determination [measures overall precision of measurement system from sample acquisition through analysis; total measurement error can be determined with field duplicate, matrix spike (MS), and matrix spike duplicate (MSD) samples].

Data meeting these requirements are referred to as definitive data [*Data Quality Objectives Process for Superfund, Interim Final Guidance* (EPA 540-R-93-071)]. Definitive data were formerly referred to as Level III Data (data generated in an offsite analytical laboratory using standard, documented procedures) and Level IV Data (Contract Laboratory Program routine analytical services) [*Data Quality Objectives for Remedial Response Activities, Development Process* (EPA/540/G-87/003)]. Definitive data meet the Data Quality Objectives for quantitative risk assessment and are considered acceptable for use in the RECAP. In general, data generated using an EPA 500 Series, 600 Series, SW-846 methods, or Contract Laboratory Program (CLP) Statement of Work (SOW) methods meet the definition of definitive data. CLP SOW methods are not required under the RECAP but may be used if additional QA/QC documentation is desired by the Submitter. Documentation for the QA/QC requirements listed above for definitive data should be requested from the laboratory at the time the sample(s) is submitted for analysis. For an AOI impacted with petroleum constituents, fraction-specific TPH data shall be obtained in addition to indicator constituent data as specified in Appendix D. As an alternative to obtaining fraction-specific TPH data, mixture-specific TPH data (TPH-GRO, TPH-DRO, and/or TPH-ORO) may be obtained as specified in Appendix D.

For routine sampling events, it is required that field QA/QC samples be collected and analyzed. The following is an example of an acceptable QA/QC set:

- 1 rinsate sample per 20 field samples,
- 1 field blank per day,
- 1 trip blank per ice chest of samples for VOA analysis,
- 1 field duplicate sample per 20 field samples, and
- 1 matrix spike/matrix spike duplicate from the site per 20 field samples.

The QA/QC submittal requirements shall include sample documentation; initial and continuing calibration data; documentation of detection limits; analyte identification and quantification; quality control blanks such as trip blanks, method blanks, and rinsate blanks; matrix spike recovery results; performance evaluation sample data; analytical error determination; and total measurement error determination.

2.5 Data Evaluation and Data Usability

Analytical results shall not be accepted at face value. All data shall be reviewed by the analytical laboratory to ensure technical compliance with the analytical method. The data review shall be conducted in accordance with standard EPA protocols. All data shall also be reviewed by the Submitter to ensure that any limitations or uncertainties associated with the data are identified so that only data that are appropriate and reliable for use in quantitative risk assessment are carried through the RECAP process. Data shall be reviewed to identify reliable, accurate, and verifiable numbers that can be used to quantitate risks. Specifically, the data shall be evaluated to assess the effect of QC issues on data usability (*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual, Part A,* EPA 540/1-89/002).

Data shall be evaluated with respect to:

(1) *Analytical Method* - In general, data generated using an EPA 500 Series, 600 Series, SW-846, or CLP SOW method will meet the definition of definitive data. Documentation for the aforementioned QA/QC requirements should be requested from the laboratory at the time the sample(s) is submitted for analysis. Analytical results that are: (a) not specific for a particular compound; (b) produced by insensitive analytical methods (e.g., analyses using portable field analytical instruments); or (c) associated with unknown, few, or no QA/QC procedures may be used in developing the conceptual site model but may not be used in determining the AOIC or the CC.

(2) *Sample Quantitation Limits* - The sample quantitation limits (SQL) should be less than the limiting SS or RS for the Option being implemented at the AOI. Prior to sample analysis, the Submitter should identify the limiting SS or RS applicable to the Option being implemented and compare those constituent concentrations to the

method detection limits (MDL) and the laboratory's practical quantitation limit (PQL) for the selected analytical method to ensure that the MDL and PQL are less than the applicable limiting standard. In the RECAP submittal, non-detected results shall be reported as less than the numerical value of the SQL (e.g., < 5 ug/l) and a comparison of the SQL to the limiting SS or RS shall be presented for all constituents reported as not detected to demonstrate that the SQL are less than or equal to the limiting SS or RS prior to eliminating a COC from further assessment. If the limiting SS or limiting RS is less than the laboratory's PQL, the Submitter shall select the most sensitive standard analytical method available (i.e., the analytical method with the lowest PQL) for the COC and the PQL shall serve as the limiting SS or limiting RS. A PQL selected by the Submitter to serve as the limiting standard is subject to Department approval. If a COC is reported as not detected (< SQL) and the SQL for the constituent is greater than the limiting SS or RS for a significant number of samples for that medium (e.g., greater than or equal to 5 to 10 percent), then the samples shall be reanalyzed. If a COC is reported as not detected (< SQL) for a key sampling location (e.g., drinking water well) and the SQL for the constituent is greater than the limiting SS or RS, then the sample shall be reanalyzed. If the SQL are elevated, the data may be considered acceptable by the Department if the following conditions are met: (a) the analytical method used is capable of achieving a PQL that is below the limiting standard; and (b) an analytical laboratory accredited by the State of Louisiana (http://www.deq.state.la.us/laboratory/apps.asp) (or an analytical laboratory that is exempt from accreditation) provides documentation to the Department that the PQL was not achievable due to site- or sample-specific considerations such as matrix interferences. Constituent concentrations detected below the PQL but above the MDL are flagged with a J qualifier (organics) or a B qualifier (inorganics) which indicates the reported concentration is estimated because the concentration falls below the calibration range, i.e., the concentration detected is below the lowest concentration on the calibration curve (PQL). Under the RECAP, the results reported as J-qualified (concentration estimated) shall be evaluated as positive data since there is certainty as to the presence and identity of the constituent.

(3) *Qualifiers and Codes* - Any anomalies in the data shall be noted in the laboratory report or by the data reviewer using qualifiers or codes to identify any potential problems in the data. Each qualifier or code shall be defined and include a statement on the useabililty of the data under the RECAP and the uncertainty in the data represented by the qualifier or code. All qualifiers and codes shall be addressed before the data are included in the RECAP process. For guidance on the use of qualified and coded data in quantitative risk assessment refer to *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual, Part A,* (EPA 1989) and *Guidance for Data Useability in Risk Assessment, Part A*, (EPA 1992, 9285.7-09A). In general, all qualified data are considered suitable for inclusion in the quantitative risk assessment process with the exception of data flagged with the qualifier R (unusable organic and inorganic data). Results flagged with a J (organics) or a B (inorganics) (estimated concentration) qualifier shall be included as positive results. If an estimated concentration drives or contributes significantly to the risk at

the AOI, the uncertainty associated with the estimated concentration shall be clearly addressed in the data evaluation section of the submittal.

(4) *Blank Samples* - Blank samples provide a measure of contamination that has been introduced into a sample set either: (a) in the field while the samples were being collected or transported to the laboratory, or (b) in the laboratory during sample preparation or analysis. To prevent the inclusion of non-site-related constituents in the risk assessment, the concentrations of constituents detected in blanks shall be compared with concentrations of the same constituents detected in site samples. Acetone, 2-butanone, methylene chloride, toluene, cyclohexane, and the phthalates are considered by EPA to be common laboratory contaminants. If the blank contains detectable concentrations of common laboratory contaminants, then the sample results should be considered as positive results only if the concentration in the sample exceeds ten times the maximum amount detected in any blank. If the blank contains detectable concentrations of one or more organic or inorganic constituents that are not considered by EPA to be common laboratory contaminants, the site sample results should be considered as positive only if the concentration of the constituent in the site sample exceeds five times the maximum amount detected in any blank. For additional information on blank samples refer to *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual, Part A* (EPA 1989); *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis* (EPA 1999); *Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis* (EPA 2002); *National Functional Guidelines for Organic Data Review* (EPA 1991); and *Guidance on Environmental Data Verification and Data Validation* (EPA 2002).

(5) *Tentatively Identified Compounds (TIC)* - An effort to classify TIC into compound classes should be conducted and a qualitative judgment of the potential toxicity, at the class level, without definitive identification of each compound, should be made. If the chemical class contains carcinogenic or otherwise toxic constituents, then confirmation of the identity of the TIC may be indicated. When only a few TIC are present and no historical or other site information indicates that a particular TIC may indeed be present at the site, the TIC are generally not included in the risk assessment. A TIC may be eliminated from the list of COC if: (a) the Department concurs that the TIC is not known or suspected to be present at an AOI (i.e., the TIC is not associated with current or historical operations at the AOI and the TIC is not a transformation product of constituents present at the AOI); (b) no EPA toxicity values are available for the TIC; and (c) the TIC is not the primary COC at the AOI in terms of distribution and concentration. However, when a TIC is known or suspected to be present at an AOC or an AOI, the identities of the TIC shall be confirmed using SAS and/or the methods presented in *Guidance for Data Useability in Risk Assessment (Part A), Final* (EPA 1992) and the TIC shall be included as a COC. In addition, a TIC that has an EPA toxicity value shall be identified as a COC and included in the RECAP process. Note: The identification of TIC is not required at sites impacted with petroleum hydrocarbons.

The results of the **data evaluation** shall be presented in the RECAP submittal (RECAP Form 3) and shall address: (1) the appropriateness of the analytical method used and the sample quantitation limits; (2) the results of the blank analyses; (3) the TIC detected; (4) any calibration or matrix spike recoveries outside the acceptable range; (5) the results of the performance evaluation; and (6) the precision of the analyses. Based on the evaluation of the QA/QC data and the reported results, the Submitter shall make recommendations in the RECAP submittal concerning the usability of the data for RECAP purposes. Data determined not to be acceptable for RECAP shall be identified and justification for the determination shall be given. General guidelines on determining the usability of data for risk assessment purposes can be obtained in *Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Volume I, Part A* (EPA 1989). More detailed guidelines are available in *Guidance for Data Useability in Risk Assessment, Part A, Final* (EPA 1992).

If the Submitter opts to use **EPA Contract Laboratory Program (CLP) Statement Of Work (SOW) methods, data validation** shall be conducted in accordance with the guidelines presented in *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 1999); *Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis* (EPA 2002); *Guidance on Environmental Data Verification and Data Validation* (EPA 2002); and *Guidance for Data Useability in Risk Assessment, Part A* (EPA 1992). These guidelines may also be used to review non-CLP data where applicable.

The use of **historical data** in the RECAP process shall be in accordance with the following guidelines:

(1) The quality of historical data shall be determined prior to their use in the RECAP. Historical data shall be compared to current data with respect to analytical methods, QA/QC, and reported concentrations. Historical data may be combined with current data to determine the AOIC if: (a) the methods used to analyze the samples are similar in terms of the types of analyses conducted and the QA/QC procedures followed; and (b) the constituents and concentrations detected in the historical data are consistent with the current data (i.e., the historical data are similar to the current data).

(2) Historical data of **unknown** quality may be used in developing the conceptual model but may **not** be used in determining the AOIC.

(3) Sampling techniques, analytical methods, QA/QC procedures, and quantitation limits for the historical data shall be documented in the RECAP submittal.

(4) Historical data may **not** be combined with current data to determine the AOIC if: (a) the methods used to analyze historical data are dissimilar to those used to collect the current data; or (b) the methods and QA/QC are similar for the historical and current data sets, but the concentrations of a COC are significantly different for a defined AOI. For these situations, the most recent data set shall be used in determining the AOIC or CC.

(5) If the methods and QA/QC are similar for the historical and current data sets, the historical data may be used for a quantitative analysis of changes in constituent concentrations over time.

(6) The elimination of any data set shall be justified and fully described in the RECAP submittal (*Guidance for Data Useability in Risk Assessment*, EPA 1992; *Supplemental Region IV Risk Assessment Guidance*, EPA 1992).

Data Format: Data shall be submitted in a tabular format in accordance with the RECAP forms presented in Appendix C or similar format containing all the information contained in the Appendix C format. In addition, a summary table of data to be used in the RECAP assessment shall be provided in the submittal for each impacted medium and shall include the analyte, the number of samples, the frequency of detection, the sample quantitation limits, the minimum concentration detected, the maximum concentration detected, and if the maximum detected concentration is not used, the mean (95%UCL-AM) concentration detected for each medium. The data shall be presented in units of mg/kg (soil and sediment), mg/l (water), or $\mu g/m^3$ (air). The QA/QC data (sample documentation, initial and continuing calibration data, determination and documentation of quantitation limits, analyte identification and quantitation, QC blanks, matrix spike recoveries, performance evaluation samples, analytical error determination, and total measurement error) shall be included in the RECAP submittal. The raw analytical data including chromatograms and additional QA/QC information may be requested by the Department on an "as-needed" basis and shall be retained by the Submitter for a period of at least three years.

2.6 Identification of the Area of Investigation and the Constituents of Concern

2.6.1 Identification of the Area of Investigation

The Area of Investigation (AOI) is the zone contiguous to, and including, impacted media defined vertically and horizontally by the presence of one or more constituents in concentrations that exceed the limiting standard applicable for the Option being implemented. If an AOC is managed under more than one Option, the AOI (soil and groundwater) shall be identified using the limiting standard identified for the highest Option that has been completed to date for the AOI. An AOI shall be identified for each impacted medium including soil, groundwater, surface water, and sediment.

2.6.1.1 General Guidelines for Identification of the AOI

The AOI shall be identified for each Option in accordance with the guidelines presented below. For further guidance on identifying the AOI for unusual or complex site conditions, refer to Section 2.6.1.2.

(1) ***Screening Option.*** For a SO assessment, the limiting SS shall be used to identify the AOI. If the most heavily impacted area(s) known or suspected to be present within the AOC has been adequately investigated and the Department concurs that the

highest constituent concentrations within the AOC have been characterized, then the identification of an AOI may not be required under the SO.

(2) ***Management Option 1.*** For a MO-1 assessment, the limiting SS shall be used to identify the AOI.

(3) ***Management Option 2.*** For a MO-2 assessment, the limiting MO-1 RS shall be used to identify the AOI. If a MO-1 assessment has not been conducted and the soil and/or groundwater meets the criteria for management under the SO, the limiting SS (or site-specific SS, refer to Section 3.0) shall be used to identify the soil and groundwater AOI. Note: If the soil or groundwater does not meet the criteria for management under MO-1 or the AOI is based on an exposure pathway not addressed by the MO-1 RS, then the AOI shall be identified using an approved analytical quantitation limit or the applicable MO-2 RS.

(4) ***Management Option 3.*** For a MO-3 assessment, the limiting MO-2 RS shall be used to identify the soil and groundwater AOI. If a MO-2 assessment has not been conducted and the soil and groundwater meet the criteria for management under MO-1, then the MO-1 limiting RS shall be used to identify the AOI. If neither a MO-2 nor MO-1 assessment has been conducted and the soil and groundwater meet the criteria for management under the SO, then the limiting SS (or site-specific SS, refer to Section 3.0) shall be used to identify the AOI. Note: (1) An AOI for an environmental medium or an exposure pathway not addressed by the SS, MO-1 RS, or MO-2 RS; or (2) an AOI that does not meet the criteria for management under the SO, MO-1, or MO-2 shall be identified using a Department-approved background level, a Department-approved analytical quantitation limit, or the applicable MO-3 RS.

(5) ***All Options.*** The same limiting standard shall be used to identify the AOI and the COC (refer to Section 2.6.2).

(6) Any variance from these requirements is subject to Department approval prior to submission of the RECAP evaluation.

<u>2.6.1.2 Site-Specific Considerations for the Identification of the AOI</u>

For an AOC with site characteristics (e.g., land use, exposure pathways, COC distribution, multiple releases, or other unusual site conditions) that require special consideration when identifying the AOI, refer to the guidelines presented below.

(1) To determine if more than one AOI should be identified at an AOC, site-specific conditions such as the constituent type(s) and distribution, land use, receptor activity patterns, and exposure pathways at the AOC shall be taken into consideration. The identification of multiple AOI within an AOC is subject to Department approval. Multiple AOI within an AOC shall be identified as follows:

(a) If the AOC contains impacted areas (i.e., areas characterized by constituent concentrations above the limiting SS or RS) that are distinctly separated by non-impacted areas (i.e., areas characterized by constituent concentrations less than or equal to the limiting SS or RS), then multiple AOI shall be identified. In general, a limited area defined by one or two non-detect sampling locations will not be considered adequate to divide an AOC into two AOI unless the impacted areas are characterized by different constituents indicating the presence of two separate releases.

(b) If an AOC is comprised of multiple releases characterized by different constituents and distinct areas of impact can be delineated for each release, then an AOI shall be identified for each release.

(c) If multiple constituents are present at the AOC, the Submitter may: (i) identify one AOI that includes all of the COC (i.e., the boundaries of the AOI shall be defined by all sampling locations that have at least one constituent present at a concentration that exceeds the limiting standard for the Option being implemented); or (ii) identify an AOI for each constituent present within the AOC (i.e., the boundaries of an AOI for one constituent shall be defined by the sampling locations that have concentrations that exceed the limiting standard for that particular constituent). Note: Multiple AOI identified for each constituent will be superimposed on one another.

(d) If land use varies within the AOC (e.g., constituents have migrated from an industrial site to a residential area), then an AOI shall be identified for each type of land use within the AOC (refer to Figure 4). Where appropriate, site-specific factors such as property boundaries and receptor activity patterns shall be taken into consideration when delineating the boundaries of the AOI.

(e) If the pathways of exposure vary within the AOC, then pathway-specific AOI shall be identified based on site-specific conditions and constituent distribution in the area of exposure for the exposure pathway of concern [e.g., if a small portion of the AOC for a soil containing a volatile constituent is located beneath an enclosed structure, then two AOI shall be identified: 1) an AOI for direct contact exposure with soil (ingestion, dermal contact, inhalation of volatile emissions to ambient air) and/or environmental fate and transport pathways shall be identified as presented above; and 2) an AOI for the volatile emissions to an enclosed structure pathway ($Soil_{es}$ AOI) shall be delineated based on the boundaries of the enclosed structure and the sampling locations that best characterize the constituent concentrations in soil beneath the enclosed structure] (refer to Figures 5, 6 and 7).

(f) The Submitter may elect to divide the AOI for surface soil into two AOI: 1) ground surface to 3 feet bgs; and 2) 3 feet to 15 feet bgs. If warranted based on site-specific conditions, the Department may require that two AOI be identified for surface soil (ground surface to 3 ft bgs and 3-15 ft bgs).

(2) If only 1 or 2 sampling locations have a constituent concentration that exceeds the limiting SS or RS, it is not possible to identify an AOI as presented above. Therefore, the Submitter may: (a) evaluate the constituent under a higher tier; (b) conduct further site investigation to confirm the AOIC; (c) conduct further investigation to obtain additional data to evaluate a specific pathway of concern (e.g., SPLP data for the soil to groundwater pathway); or (d) remediate the area exceeding the limiting SS or RS.

(3) In lieu of using the limiting standard identified for the highest Option completed, the AOI may be identified using the limiting RS for the Option currently being implemented (i.e., for a MO-1 assessment, the limiting MO-1 RS may be used to identify the AOI; for a MO-2 assessment, the limiting MO-2 RS may be used to identify the AOI; and for a MO-3 assessment, the limiting MO-3 RS may be used to identify the AOI).

(4) Any variance from these requirements is subject to Department approval prior to submission of the RECAP evaluation.

2.6.1.3 Soil AOI

If the depth of impact is less than or equal to 15 ft bgs, then an AOI shall be delineated for surface soil (the soil interval extending from ground surface to the depth of impact). **If the depth of impact is greater than 15 ft bgs**, then two soil AOI shall be delineated: (1) a surface soil AOI (the soil interval extending from ground surface to a depth of 15 feet bgs); and (2) a subsurface soil AOI (the soil interval extending from 15 feet bgs to the depth of impact). If the Department determines that it is warranted based on site-specific conditions or if the Submitter elects, the 0-15 feet bgs interval may be divided into two AOI: (1) 0-3 feet bgs; and (2) 3 feet bgs - depth of impact. The AOI shall be delineated by comparing the constituent concentration detected at each sampling location with the appropriate limiting soil standard for Option being implemented. All sampling locations having a constituent concentration that exceeds the limiting soil standard shall be identified for inclusion in the AOI. Based on these identified sampling locations, the horizontal and vertical boundaries of the AOI shall be delineated. The soil AOI shall be a three-dimensional space which contains all data points with constituent concentrations above the limiting soil SS or the limiting soil RS and all points contained **within** that space whether the concentrations are less than, equal to, or greater than the limiting soil SS or the limiting soil RS. Sampling locations **outside** the delineated AOI with reported constituent concentrations less than the limiting soil SS or the limiting soil RS shall be eliminated from further consideration.

2.6.1.4 Groundwater AOI

The groundwater plume shall be delineated by comparing the constituent concentration detected at each sampling location with the groundwater SS or the limiting groundwater RS. All sampling locations having constituent concentrations that exceed the groundwater SS or the limiting groundwater RS shall be identified. Based on these identified sampling locations, the horizontal and vertical boundaries of the groundwater plume shall be delineated. The delineated groundwater plume shall be a three-dimensional space which contains all data points with constituent concentrations above the groundwater SS or the limiting groundwater RS and all points contained **within** that space whether the concentrations are less than, equal to, or greater than the groundwater SS or the limiting groundwater RS. Sampling locations **outside** the delineated plume with reported constituent concentrations less than the groundwater SS or the limiting groundwater RS shall be eliminated from further consideration.

2.6.1.5 Sediment AOI

The AOI for sediment shall be delineated by comparing the constituent concentration detected at each sampling location with the Department-approved analytical quantitation limit, the Department-approved background concentration (refer to Section 2.13). All sampling locations having a constituent concentration that exceeds the analytical quantitation limit or the background concentration shall be identified. Based on these identified sampling locations, the horizontal and vertical boundaries of the AOI shall be delineated. The sediment AOI shall be a three dimensional space which contains all data points with constituent concentrations above the analytical quantitation limit or background concentration and all points contained **within** that space whether the concentrations are less than, equal to, or greater than the analytical quantitation limit or background concentration. Sampling locations **outside** the defined AOI with reported constituent concentrations less than the analytical quantitation limit or background concentration shall be eliminated from further consideration.

2.6.2 Identification of the Constituents of Concern

Constituents of Concern (COC) are the constituents that are site-related and the focus of the RECAP assessment. A COC list shall be developed for each impacted medium. Constituent speciation should be identified where appropriate, e.g., chromium, mercury, etc. Constituents that shall be identified as COC include: (1) constituents that are not considered by EPA as common laboratory contaminants (refer to Section 2.5) which were detected in at least one sample at a concentration that exceeds five times the maximum concentration detected in any blank sample; (2) constituents that are considered by EPA as common laboratory contaminants (refer to Section 2.5) which were detected in at least one sample at a concentration that exceeds ten times the maximum concentration detected in any blank sample; (3) a TIC known or suspected to be present at the AOI or which has been identified by SAS and EPA toxicity values are available (refer to Section 2.5); and (4) all constituents present within the AOI that exceed the limiting standard applicable for the Option being implemented. If an AOC is managed under more than one Option, the COC (soil and groundwater) for the Option currently being implemented shall be identified using the limiting standard identified for the highest Option that has been completed to date for the AOI. The Department reserves the right to alter the COC list due to site-specific considerations, such as an inordinately high number of constituents present (greater than 100) at the AOI. A reduced COC list may be approved by the Department for environmental fate and transport modeling under MO-3 when sophisticated, three-dimensional models are being used to predict future AOIC. The COC on the reduced list shall be identified based on migration potential, frequency of detection, concentration, and toxicity. The RECAP submittal should present all constituents detected at the AOI, the COC identified for each medium, and the rationale for eliminating constituents from the COC list(s). Additional guidelines for the identification of COC for petroleum hydrocarbon releases are presented in Appendix D. Guidelines for identifying the constituents that shall be included on the list(s) of COC for each Option are presented below.

(1) ***Screening Option.*** For a SO assessment, all constituents detected in at least one sample shall be identified as COC.

(2) ***Management Option 1.*** For a MO-1 assessment, all constituents whose maximum detected concentrations exceed the limiting SS shall be identified as COC.

(3) ***Management Option 2.*** For a MO-2 assessment, all constituents whose AOIC or groundwater CC exceed the MO-1 limiting RS shall be identified as COC (if the soil and/or groundwater meet the criteria for management under MO-1). If a MO-1 assessment has not been conducted and the soil and/or groundwater meet the criteria for management under the SO, then all constituents whose maximum detected concentrations exceed the limiting SS (or site-specific SS, refer to Section 3.0) shall be identified as COC. If the soil and/or groundwater do not meet the criteria for the SO or MO-1, then the COC shall be identified using a Department-approved background level, Department-approved analytical quantitation limit, or the applicable MO-2 RS.

(4) ***Management Option 3.*** For a MO-3 assessment, all constituents whose soil AOIC or groundwater CC exceed the MO-2 limiting RS shall be identified as COC (if the soil and/or groundwater meet the criteria for management under MO-2. If a MO-2 assessment was not conducted and the AOI meets the criteria for management under MO-1, then all constituents whose AOIC or compliance concentrations exceed the MO-1 limiting RS shall be identified as COC. If neither a MO-1 nor MO-2 assessment was conducted and the AOI meets the criteria for management under the SO, then all constituents whose AOIC or compliance concentrations exceed the limiting SS shall be identified as COC. If the AOI does not meet the criteria for management under the SO, MO-1, or MO-2, then the COC shall be identified using a Department-approved background level or analytical quantitation limit or applicable MO-3 RS.

(5) ***Management Options 1, 2, and 3.*** In lieu of using the limiting RS identified for the highest Option completed, the COC may be identified using the limiting RS for the Option currently being implemented at the AOC or the AOI (i.e., for a MO-1 assessment, the limiting MO-1 RS may be used to identify the COC; for a MO-2 assessment, the limiting MO-2 RS may be used to identify the COC; and for a MO-3 assessment, the limiting MO-3 RS may be used to identify the COC).

(6) ***All Options.*** The same limiting standard shall be used to identify the AOI (refer to Section 2.6.1) and the COC.

(7) Any variance from these requirements is subject to Department approval prior to submission of the RECAP evaluation.

2.7 Exposure Assessment

The exposure assessment shall include: (1) characterization of the exposure setting including current and future land use at and in the vicinity of the AOI (refer to land use definitions in Section 2.9 and Appendix E); identification of current and future on-site and off-site receptor populations and sensitive subpopulations; identification of all potential current and future exposure pathways including an evaluation of constituent sources (primary, secondary, etc.), receiving media, fate and transport in release media, potential exposure points (within a one-mile radius of the AOI), and exposure routes; (2) quantification of the AOIC for all impacted media and groundwater CC (refer to Section 2.8); and (3) application of standard default RME assumptions under the SO, MO-1, and MO-2 (refer to Appendix H) or identification and documentation of site-specific exposure data representative of a RME scenario under MO-3 (in the absence of site-specific exposure data, default RME assumptions shall be used). When a standard default exposure parameter is revised by the EPA, the revised value may only be used under MO-3. Under the SO, MO-1, and MO-2, the default exposure parameters in Appendix H shall be applied. The exposure assessment shall be conducted in accordance with the guidelines presented in *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A,* Chapter 6 (EPA 1989), *Guidelines for Exposure Assessment Notice* (EPA 1992), *Soil Screening Guidance* (EPA 1996), *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (EPA 2001), *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment)* (EPA 2000), *Guidance on Risk Characterization for Risk Managers and Risk Assessors* (EPA 1992), *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors* (EPA 1991), *Exposure Factors Handbook* (EPA 1997), and *Superfund Exposure Assessment Manual* (EPA 1988).

The exposure assessment shall include a Conceptual Site Model (CSM) for all Options implemented at the AOC unless otherwise approved by the Department. The CSM shall illustrate the known or potential constituent source(s) (primary as well as secondary and tertiary sources if applicable), routes of constituent migration, exposure media, exposure points and pathways, receptors, and source media to be evaluated under the RECAP. An example of a CSM is presented in Figure 8.

Components of the CSM shall be identified as follows: Constituent **sources** shall be identified based on site history and/or site investigation results. **Migration pathways** for the COC shall consider, where applicable, volatilization, fugitive dust generation/deposition, surface runoff, episodic overland flow, leaching, groundwater seepage, and biota uptake. **Exposure media** shall include currently impacted media to which receptors are being exposed or may be exposed or through which COC may be transported to potential receptors, and currently unimpacted media that may become impacted in the future due to COC transport. **Source media** shall include currently impacted media that may result in the transfer of constituents to another medium. **Exposure points** and potential exposure points shall be identified by determining if and where the known or potential receptors may come in contact with an exposure medium. All current or potential points of contact between a receptor and an exposure medium shall be identified as exposure points in the CSM. The **exposure pathways** and potential exposure pathways shall be identified based on the anticipated receptor activities at the exposure point(s). The identification of **receptors** and potential receptors shall consider current and future land use at the AOI.

All current and potential exposure pathways shall be included in the CSM unless it is adequately demonstrated that an exposure pathway(s) is incomplete and the Department concurs with the finding. Exposure pathways that are determined to be incomplete shall be documented as incomplete. Where applicable, documentation shall include monitoring and/or modeling data. Documentation that a groundwater exposure pathway is incomplete shall include, but may not be limited to: (1) characterization of site geology/hydrology; (2) identification of potential exposure points for a COC present in or migrating from groundwater, i.e., surface discharge point such as surface water body, ambient air, enclosed structure, and water supply well [a DOTD listing within a one-mile radius (unless otherwise warranted) obtained within the last 12 months]; and (3) demonstration that constituent concentrations will not exceed acceptable concentrations at identified exposure points. For the identification of future POE (via a groundwater environmental fate and transport analysis), constituent migration shall be simulated until the maximum concentration is predicted at the point of compliance (POC) and the simulation period shall not be less than 70 years unless otherwise approved by the Department. If the analysis indicates that a groundwater plume containing volatile constituents may potentially migrate under an enclosed structure in the future, then the inhalation of volatile emissions pathway shall be addressed for the enclosed structure. Documentation that a soil exposure pathway is incomplete shall include, but may not be limited to, demonstration that: (1) a receptor will not come in direct contact with COC due to the presence of a permanent structure (i.e., a well established building or similar structure located in an area of established, controlled land use that is not anticipated to change in the future or the planned development of a well established building or similar structure in an area of established, controlled land use under the Voluntary Cleanup Program); and (2) receptors will not be exposed to COC migrating from the soil to other media such as air, groundwater, or surface water at unacceptable concentrations. If it is adequately demonstrated that exposure to constituents present in soil will not occur, the Department may allow the soil to be evaluated as a source medium only. It should be noted that: (1) if a permanent structure is removed, then the exposure pathways for soil shall be considered complete, and exposure to COC present in the soil shall be evaluated under RECAP based on the future use of the land; and (2) for most land use scenarios, fences and concrete (or asphalt) coverings shall not be considered permanent structures and shall not serve as adequate justification that soil exposure pathways are incomplete. Soil (0-15 ft bgs) containing constituent concentrations above the applicable RS shall not remain in place unless: (1) Department approval is granted based on site-specific conditions; (2) there is sufficient financial assurance/commitment to ensure that the property will remain usable and in commerce; and (3) institutional controls are employed to ensure that unacceptable exposure does not occur (refer to Section 2.17).

The CSM shall be used throughout the RECAP process to:

(1) Identify exposure and source media;
(2) Identify current and future environmental transport pathways;
(3) Identify current and future exposure points and exposure pathways;
(4) Determine if the AOC or the AOI meets the criteria for management under the SO, MO-1 and/or MO-2;
(5) Verify that the SS, MO-1 RS, MO-2 RS, or MO-3 RS are appropriate for application at the AOC or the AOI (i.e., the exposure potential at the AOC or the AOI and the site characteristics that influence COC fate and transport are consistent with those assumed in the development of the SS and/or RS for the Option chosen); and
(6) Identify data gaps.

The CSM shall be revised as the AOI progresses through the tiers of the RECAP (SO, MO-1, MO-2, and/or MO-3) so that the model illustrates only those sources, migration pathways, exposure media, exposure points/pathways, receptors, and source media identified for evaluation under the Option currently being implemented (i.e., sources, source media, migration pathways, exposure media, exposure points, and exposure pathways eliminated (screened out) from further consideration at the conclusion of a given level of assessment shall be excluded from the CSM for the next level of assessment).

If a constituent is present in, or suspected to be present in, a medium regulated under the RECAP (soil, groundwater, air, surface water, sediment, and/or biota) and the exposure assessment/CSM indicate that exposure to the medium is possible, or likely, based on site-specific conditions (location, land use at or adjacent to the AOI, receptor accessibility, receptor activity patterns, etc.), then the medium shall be included in the RECAP assessment (i.e., RECAP Standards shall be developed for all applicable exposure pathways and/or cross-media transfer pathways identified for the medium of concern).

2.8 Area of Investigation Concentration and Groundwater Compliance Concentration

The **AOI concentration (AOIC)** is defined as: 1) the concentration of the COC in the environmental medium to which the receptor is exposed or may be exposed in the future; and/or 2) the concentration of the COC in an environmental medium that may serve as a source for constituent transport and/or transfer to another environmental medium. The AOIC is the concentration of the COC in the environmental medium that is compared to the limiting SS or the MO-1, MO-2, or MO-3 limiting RS to determine if the constituent concentrations present in the medium are acceptable (less than or equal to the limiting standard) or unacceptable (greater than the limiting standard) for the Option being implemented (with the exception of groundwater, refer to compliance concentration below). An AOIC shall be determined for all impacted media or potentially impacted media identified in the CSM. The AOIC shall be presented in unit of parts per million (ppm) (mg/kg and mg/l) for all media except air which shall be presented in units of ppb (ug/m^3).

The AOIC shall be represented by:

(1) The **maximum** constituent concentration (SO, MO-1, MO-2, and MO-3) detected at the AOC/AOI. The maximum detected concentration shall be representative of the most heavily impacted area(s) known or suspected to be present within the AOC and is subject to concurrence by the Department;

or

(2) The 95 percent upper confidence limit on the arithmetic mean (**95%UCL-AM**) constituent concentration (MO-1, MO-2, and MO-3) detected at the AOI. Refer to Section 2.8.2 for further guidance on using the 95%UCL-AM concentration to represent the AOIC.

If the 95%UCL-AM constituent concentration is greater than the maximum detected concentration, then the maximum constituent concentration shall be identified as the AOIC. If the maximum detected constituent concentration is used as the AOIC, then calculation of the 95%UCL-AM concentration shall not be required.

The **compliance concentration (CC)** is defined as the COC concentration detected in groundwater at the POC (refer to Section 2.11 for identification of the POC and POE). The CC is the concentration of the COC in groundwater that is compared to the groundwater SS or the MO-1, MO-2 or MO-3 limiting RS to determine if the constituent concentrations present in the groundwater are acceptable (less than or equal to the limiting RS) or unacceptable (greater than the limiting RS) for the Option being implemented. Compliance concentrations shall be determined for all POC for groundwater meeting the definition of Groundwater Classification 1, 2, or 3. If a POE is present within the AOI for a groundwater Classification 1 or 2 aquifer, then the COC concentration detected at the POE shall be used to demonstrate compliance with the limiting SS or the limiting RS. The groundwater CC shall be presented in units of mg/l.

2.8.1 AOI Concentration for the Screening Option

For the SO, the maximum detected constituent concentration shall be used as the AOIC and shall be presented in units of mg/kg. The maximum concentration used in the screening process shall be representative of the most heavily impacted area(s) known or suspected to be present within the AOC. Identification of the most heavily impacted area(s) is subject to concurrence by the Department. Facilities with multiple AOI shall identify a separate AOIC for each AOI.

2.8.2 AOI Concentration for Management Options 1, 2, and 3

The AOIC is the constituent concentration that shall be compared to the limiting RS. For MO-1, MO-2, and MO-3, the lower of the 95%UCL-AM constituent concentration and the maximum detected concentration shall be used as the AOIC. **For small data sets (less than 10 samples) or data sets with high variability, it is likely that the 95%UCL-AM concentration will be greater than the maximum detected concentration. In these instances, the maximum detected constituent concentration shall serve as the AOIC. NOTE: If the maximum detected constituent concentration is used as the AOIC, calculation of the 95%UCL-AM concentration shall not be required.** For the evaluation of future exposure/risk under MO-3, the highest concentration predicted (via modeling) to reach an identified exposure point(s) shall be used as the AOIC.

The 95%UCL-AM constituent concentration is used to represent the AOIC because: (1) carcinogenic and chronic noncarcinogenic toxicity criteria are based on a lifetime average exposure; (2) the average concentration is most representative of the concentration that would be contacted over time; and (3) there is uncertainty associated with estimating the true average concentration at an AOI. (The 95%UCL provides reasonable confidence that the true AOI average will not be underestimated. The 95%UCL-AM is defined as a value that, when calculated repeatedly for randomly drawn subsets of data, equals or exceeds the true mean 95 percent of the time.) The 95%UCL-AM is considered appropriate to represent the AOIC regardless of the pattern of daily exposures over time or the type of statistical distribution that might best describe the sampling data.

The 95%UCL-AM shall be calculated in accordance with the methodology presented in *Supplemental Guidance to RAGS: Calculating the Concentration Term* (EPA 1992, 9285.7-081) using the LDEQ spreadsheet at http://www.state.la.us/technology/RECAP/ or a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. Prior to the calculation of the 95%UCL-AM, the distribution of the constituent concentrations present within the AOI should be determined by plotting the data (constituent concentration detected versus the number of observations per concentration) or by using statistical methods such as the Wilk-Shapiro test (W-test). **Environmental data sets collected randomly are assumed to be log-normally distributed and transformation of the data to logarithmic equivalents is required. The H-statistic shall be used to estimate the 95%UCL-AM constituent concentration for data sets that are log-normally distributed.** If the data set is thought to be normally distributed, then a test of normality shall be conducted. For data sets that are normally distributed, the student t-statistic shall be used to estimate the 95%UCL-AM constituent concentration. If the data set is normally distributed, the sampling design used for data collection shall be evaluated to ensure that the most heavily impacted areas of the AOC have been adequately sampled/characterized and the submittal shall include a plot of the data demonstrating normal distribution. In general, the 95%UCL-AM concentration is representative of the AOIC where the COC is log-normally or normally distributed. At an AOI where the data set is not normally or log-normally distributed (e.g., comprised of a large proportion of non-detect results), it may be more appropriate to use an alternate measure of central tendency or a 95%UCL-AM estimated using nonparametric statistical methods for the estimation of the AOIC. (*Data Quality Objectives Process for Superfund Interim Final Guidance*, EPA 1993). In the event the COC distribution at an AOI is such that standard statistical methods are not applicable or appropriate for the estimation of an upper bound mean constituent concentration, the Department may require that the limiting RS be met throughout the AOI. This approach serves to: (1) eliminate the uncertainty that may be associated with estimating an upper bound mean concentration at an AOI characterized by a unique COC distribution; and (2) ensure that the COC concentrations remaining at the AOI do not pose an unacceptable risk to human health or the environment.

In the calculation of the 95%UCL-AM constituent concentration for the AOI, all positively detected results (including estimated values flagged with a J qualifier) as well as non-detected results within or on the boundaries of the AOI shall be considered. All non-detect values shall be reported numerically as less than the SQL (e.g., < 0.005 ug/l) **not** as non-detect (ND). All SQL values shall be compared to the limiting RS to document that the SQL is less than or equal to the RS prior to eliminating a constituent from the RECAP assessment. All data points within the AOI shall be used in the calculation of the AOIC unless skewed due to sample bias. If only some of the samples in a medium within the AOI test positive for a constituent, the non-detected results shall not be omitted and zero shall not be substituted for the SQL. The non-detects for the AOI shall be addressed using simple substitution methods, distributional methods, or robust methods. Most commonly, substitution methods are used. This method involves the substitution of a single value as a proxy for each non-detected data value. Frequently used values include the SQL, one-half of the SQL, or the SQL divided by the square root of 2. For a non-detected result for a COC in a sample that is temporally/spatially related to samples containing detected results above the SQL, the value equal to the SQL (rather than one-half the SQL or the square root of the SQL) shall be used as the proxy concentration for the calculation of the 95%UCL-AM constituent concentration. When the SQL is not known and it is not possible or practical to obtain the SQL, the MDL or the value at which the data were censored shall be used as the proxy concentration for the calculation of the 95%UCL-AM concentration. For data sets used for screening purposes, the non-detects shall be assigned the value of the SQL for the COC. Distributional or robust methods shall be used if the non-detects exceed 10 to 15 percent of the data set or if the data set is highly skewed for the AOI. When a relatively large number of non-detect results are present within the AOI, the variability of the data set may be artificially reduced resulting in an artificially low 95%UCL-AM constituent concentration. For further information on simple substitution, distributional, or robust methods refer to *Guidelines for Exposure Assessment Notice* (EPA 1992). Justification shall be given for the method selected and the effect the method may have on summary statistics (95%UCL-AM) shall be discussed in the report. For other issues involving SQL refer to *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual, Part A* (EPA 1989). The 95%UCL-AM calculations shall be included in the assessment report including a summary table of the data set used to calculate the 95%UCL-AM constituent concentration for each impacted medium and/or AOI. If the data are assumed to be normally distributed, the submittal shall also contain a data plot demonstrating normal distribution of constituent concentrations at the AOI.

<u>2.8.2.1 AOIC for Soil for MO-1, MO-2, and MO-3 Assessments</u>

If the depth of impact is less than or equal to 15 feet bgs, the AOIC shall be based on the lower of the 95%UCL-AM constituent concentration and the maximum detected constituent concentration for the soil interval extending from ground surface to the depth of impact (surface soil interval). **All** data points (including data points with constituent concentrations less than, equal to, or greater than the limiting standard) located **on** or **within** the boundaries of the AOI from ground surface to the depth of impact shall be included in the calculation of the AOIC unless skewed due to sample bias. If the Department determines that it is warranted based on site-specific conditions (or if the Submitter elects) to divide the 0-15 feet bgs interval into two intervals (0-3 feet bgs and 3 feet bgs - depth of impact), then two AOIC shall be identified: 1) the 95%UCL-AM or the maximum detected constituent concentration for the soil interval extending from ground surface to 3 ft bgs; and 2) the 95%UCL-AM or the maximum detected constituent concentration for the soil interval extending from 3 ft bgs to the depth of impact.

If the depth of impact is greater than 15 feet bgs, two AOIC shall be determined: (1) an AOIC for surface soil (the soil interval extending from ground surface to 15 feet bgs); and (2) an AOIC for subsurface soil (the soil interval extending from 15 feet bgs to the depth of impact). The AOIC for the surface soil interval shall be the lower of the 95%UCL-AM constituent concentration and the maximum detected concentration for the soil interval extending from ground surface to 15 feet bgs. **All** data points (including data points with constituent concentrations less than, equal to, or greater than the limiting standard) located **on** or **within** the boundaries of the AOI from ground surface to a depth of 15 feet bgs shall be included in the calculation of the AOIC for the surface soil interval unless skewed due to sample bias. The AOIC for the subsurface soil interval shall be the lower of the 95%UCL-AM constituent concentration or the maximum detected concentration for the soil interval extending from 15 feet bgs to the depth of impact. **All** data points (including data points with constituent concentrations less than, equal to, or greater than the limiting standard) located **on** or **within** the boundaries of the AOI from 15 feet bgs to the depth of impact shall be included in the calculation of the AOIC for the subsurface soil interval unless skewed due to sample bias.

Dry Weight versus Wet Weight. In general, it is not necessary to adjust the reported constituent concentration in soil prior to calculation of the AOIC. Typically, exposure concentrations (and the risk-based SS and RS) are based on a wet-weight concentration whereas source concentrations (and environmental fate and transport SS and RS) are based on a dry-weight concentration. Analytical data for soil are routinely reported on a wet-weight basis. If requested, the analytical laboratory can report the percent moisture of the sample to allow for the conversion of the results to a dry-weight basis. In general, most soils have a relatively low percent of moisture and the difference between the wet-weight concentration and the dry-weight concentration is not usually significant. **Therefore, it is not necessary to adjust the reported constituent**

concentration prior to calculation of the AOIC for comparison with an environmental fate and transport SS or RS. For soils with a high moisture content (such as sediment), the wet-weight and dry-weight concentrations may differ significantly, therefore, the reported concentration should be adjusted to account for the percent moisture prior to calculation of the AOIC for comparison with a environmental fate and transport SS or RS. The wet-weight concentration may be converted to the dry-weight concentration as follows:

$$\text{Dry-weight concentration} = \frac{\text{Wet-weight concentration}}{\text{1 kg wet soil}} \times \frac{\text{1 kg wet soil}}{\text{1.0 - (\% moisture) kg dry soil}}$$

Facilities with multiple AOI shall develop a separate AOIC for each AOI. The soil AOIC shall be compared to the limiting standard for the Option being implemented.

2.8.2.2 AOIC for Soil Impacted with a Volatile Constituent Located Beneath an Enclosed Structure for MO-1, MO-2, and MO-3 Assessments

If the soil impacted with a volatile constituent is located beneath an enclosed structure, the AOIC shall be the lower of the 95%UCL-AM constituent concentration and the maximum detected concentration for the soil located beneath the enclosed structure. If it is technically infeasible to characterize the soil beneath the enclosed structure, then the AOIC shall be the lower of the 95%UCL-AM constituent concentration and the maximum detected concentration for the soil located immediately adjacent to the enclosed structure that is most likely to be representative of the COC concentration in soil beneath the structure. The AOIC for soil shall be presented in units of mg/kg.

2.8.2.3 AOIC for Groundwater Source Modeling for MO-3 Assessments

For the prediction of future constituent concentrations at the POC or potentially reaching a POE, the lower of the 95%UCL-AM constituent concentration and the maximum detected concentration shall be used as the AOIC for groundwater environmental fate and transport models which allow for the input of a single constituent concentration. **All** data points (including data points with constituent concentrations less than, equal to, or greater than the SS) located **on** or **within** the boundaries of the groundwater plume shall be included in the calculation of the AOIC unless skewed due to sample bias. For an environmental fate and transport model which allows for the input of multiple constituent concentrations, the constituent concentrations detected at individual sampling locations shall be used. Facilities with multiple groundwater plumes shall develop a separate AOIC for each plume. The AOIC for groundwater shall be presented in units of mg/l.

2.8.2.4 AOIC for Sediment for MO-3 Assessments

The AOIC for sediment shall be the lower of the 95%UCL-AM concentration and the maximum concentration for the AOI. The AOI shall be delineated by comparing the constituent concentration for each sampling location with the respective quantitation limit or Department-approved background concentration. **All** data points (including data points with constituent concentrations less than, equal to, or greater than the appropriate quantitation limit or Department-approved background concentration) located **on** or **within** the boundaries of the AOI shall be included in the calculation of the AOIC unless skewed due to sample bias. The AOIC for sediment shall be presented in units of mg/kg.

2.8.2.5 Exposure Concentration for Biota for MO-3 Assessments

The exposure concentration for biota shall be the lower of the 95%UCL-AM constituent concentration and the maximum detected constituent concentration for the edible portion of the samples collected. For estimated current and future biota concentrations, the highest modeled constituent concentration shall be used as the exposure concentration. An exposure concentration shall be established for each target species or group of species as appropriate based on species-specific and site-specific considerations. Tissue concentrations shall be presented in units of mg/kg.

2.8.3 Groundwater Compliance Concentration

The CC is the constituent concentration detected in **groundwater** at the POC (refer to Section 2.11 for guidelines on establishing the POC) that is compared to the groundwater SS or limiting RECAP Standard. If, based on site-specific conditions, it is determined that the COC concentration detected at the POC is not representative of the COC concentration present in the groundwater in the source area, the COC concentration detected at the POC shall be adjusted prior to being compared to the SS or limiting RS (e.g., if the distance from the source area to the POC is greater than 50 feet, then the COC concentration detected at the POC shall be multiplied by a DAF to account for dilution and attenuation of the COC concentration due to migration from the source area to the POC). Compliance concentrations shall be determined for all POC for groundwater meeting the definition of Groundwater Classification 1, 2, or 3 and shall be presented in units of mg/l. If a POE is present within the AOC or the AOI for a Groundwater Classification 1 or 2 aquifer, then the COC concentration detected at the POE shall be used to demonstrate compliance with the limiting RS. Facilities with multiple groundwater plumes or multiple POC shall develop a compliance concentration for each plume and/or POC. For the evaluation of future exposure/risk under MO-3, the highest concentration predicted via groundwater fate and transport modeling to reach the POC shall be used as the CC. Constituent migration shall be simulated until the maximum concentration is predicted at the POE and the simulation period shall not be less than 70 years unless otherwise approved by the Department. The compliance concentration shall be compared to the SS or the limiting MO-1, MO-2, or MO-3 groundwater RS.

2.9 Land Use

Current and future land use shall be determined in order to characterize the activities and activity patterns of the potentially exposed population. The current and future land use category assigned to the AOI is subject to Department approval. The following land use categories shall be used for the RECAP:

2.9.1 Industrial/Commercial

Industrial/Commerical land use refers to any property not currently used for human habitation on a permanent or temporary/intermittent basis having the following North American Industry Classification System (NAICS) major group numbers 11-21; 22 (except 22131); 23-56 inclusive; 61 (except 61111, 61121, 61131); 62 (except 62211, 62221, 62231, 62311, 62322, 623311, 623312, 62399, 62411, and 62441); 71 (except 71219); 72 (except 721191, 721211, and 72131); 81 (except 81411); and 92 (except 92214). The NAICS codes are defined in Appendix E. Industrial/Commerical property shall include any block(s) or lot(s) of land controlled by the same owner or operator that are vacant land(s) found within or beside developed land(s). For leased lands, industrial/commerical property includes the leasehold and any containers, vessels, tanks, or any other contrivances or units that provide for the management of COC to or from the leasehold. If the Submitter proposes to manage the AOC or AOI under an industrial/commerical land use scenario, the AOC or AOI shall meet the following additional criteria: the facility is zoned for industrial use (areas not zoned shall be considered as industrial if the property is currently used for industrial purposes and the use falls under one or more of the NAICS codes) and future use of the property remains industrial. If land use at an AOC or an AOI managed under the RECAP changes from industrial/commercial to non-industrial, the Submitter/responsible party shall notify the Department within 30 days and the AOI shall be re-evaluated. If a residential dwelling is located within the AOI (e.g., house trailer on industrial property), the land use shall be considered residential for the purpose of management of the AOI under the RECAP. If constituent migration from an industrial site has impacted an adjacent residential area, an industrial AOI and a residential AOI shall be identified. It should be noted that industrial dumping on rural land does not constitute industrial land use.

2.9.2 Non-industrial

Non-industrial land use refers to any property that does not meet the exclusive definition of an industrial property. Such properties may be residential, recreational, farming (livestock or vegetative), or undeveloped lands that are not included in the industrial property description (privately-owned lands, wetlands, state and national parks). For the SO, MO-1, and MO-2, a non-industrial land use scenario shall be represented by a residential scenario.

If future land use is unknown at the AOI, a future non-industrial scenario shall be assumed unless there is a strong reason to assume otherwise. Justification/documentation for not considering a non-industrial scenario shall be included in the RECAP submittal.

In some cases, an industrial facility may house a day care center within the boundaries of the facility or a person or persons reside at the facility in a designated housing unit. The Submitter, in order to retain and use the industrial scenario, shall demonstrate to the Department that acceptable exposure levels (RS) for a non-industrial scenario will not be exceeded at the day care center or housing unit.

If land use at an AOI managed under the RECAP changes (or is likely to change) from industrial/commercial to non-industrial, the Submitter/responsible party is required to notify the Department within 30 days.

For further guidance on land use issues refer to *Land Use in the CERCLA Remedy Selection Process* (EPA 1995).

2.10 Groundwater/Aquifer Use

For the purpose of implementing the RECAP, groundwater shall be classified into Groundwater Classification 1, 2, or 3, as determined by current or potential use, maximum sustainable yield, and/or Total Dissolved Solids (TDS) concentration. The Groundwater Classification assigned to the aquifer(s) of concern by the Submitter is subject to Department approval. The information required to classify the groundwater zone(s) of concern at the AOI shall be collected during the site investigation and shall include: (1) the current use of the aquifer determined by identifying all existing water wells and usage within one-mile radius of the AOI property boundaries (at a minimum, a DOTD well survey obtained within the past 12 months and a 500-foot radius walking receptor survey shall be performed); (2) the maximum sustainable yield determined by well yield estimation methods or by direct measurements which are outlined in Appendix F; and/or (3) the background total dissolved solids (TDS) concentration of the aquifer of concern determined by EPA Method 160.1. Note: Well yield measurements obtained from an aquifer that is hydraulically connected to a nearby surface water body may be influenced by the surface water body and not representative of the aquifer storativity. Therefore, the aquifer may be classified as a Groundwater Classification 3 zone after an adequate demonstration is made to the Department that the well yield measurements are influenced by pumpage from the surface water body. In lieu of classifying the groundwater zone of concern based on current or potential use, maximum sustainable yield, and/or TDS concentration, the Submitter may assume the zone is a Groundwater Classification 1 zone (Exception: If the AOI is eligible for reimbursement under the motor fuels trust fund, the Submitter may assume the zone is a Groundwater 1 zone only if approved by the Department).

All impacted underground waters of the state shall be evaluated using one of the groundwater classifications defined under RECAP.

The identifying criteria for the three Groundwater Classifications are defined as follows:

Groundwater Classification 1

Class 1A: Groundwater within an aquifer or that has a direct hydraulic connection to an aquifer that currently supplies drinking water to a public water supply. A public water supply is defined as a water supply which provides water to the public and has a minimum of 15 service connections or regularly serves a minimum of 25 individuals daily at least 60 days out of the year (State of Louisiana Sanitary Code);

or

***Class 1B*:** Groundwater within an aquifer that could potentially supply drinking water to a public water supply. The aquifer should be sufficiently permeable to transmit water to a well at a maximum sustainable yield of greater than or equal to 4,800 gallons per day (gpd) (6 households x 4 persons per household x 100 gpd x peaking factor of 2); **and**

Groundwater quality is such that it has a TDS concentration less than or equal to 1,000 milligrams per liter (mg/l).

NOTE:

(1) An aquifer meeting the Groundwater Classification 1 criteria is considered an underground source of drinking water and shall be protected or restored to its maximum beneficial use (residential use).

(2) A water supply that serves greater than six households is considered to be a public water supply as it is assumed that the average household has four occupants. Each person in the household is considered to use 100 gallons of water per day (Louisiana Department of Health and Hospitals). To ensure that water is available on an as-needed basis, a peaking factor of two has been applied to the daily water consumption rate. Therefore, a value of 4,800 gpd has been established as the minimum sustainable yield for a public water supply.

Groundwater Classification 2

Class 2A: Groundwater within an aquifer that currently supplies water to a domestic water supply, agricultural supply or any other supply. A domestic water supply is defined as one which provides water to an individual household or households but is not considered to be a public water supply as defined in Groundwater Classification 1;

or

Class 2B: Groundwater within an aquifer that could potentially supply drinking water to a domestic water supply. The aquifer should be sufficiently permeable to transmit water to a well at a maximum sustainable yield of greater than or equal to 800 gpd and less than 4,800 gpd (4 persons per household x 100 gpd x peaking factor of 2); **and**

Groundwater quality is such that it has a TDS concentration less than or equal to 1,000 mg/l;

or

Class 2C: Groundwater within an aquifer that could potentially supply drinking water to a domestic water supply. The aquifer should be sufficiently permeable to transmit water to a well at a maximum sustainable yield of greater than or equal to 800 gpd; **and**

Groundwater quality is such that it has a TDS concentration greater than 1,000 mg/l and less than or equal to 10,000 mg/l.

NOTE:

(1) If a public water supply well is located within one mile of the AOI property boundaries and is screened in the same stratum as the aquifer of concern or has a direct hydraulic connection, then the aquifer shall be classified as a Groundwater Classification 1 aquifer.

(2) It is assumed that the average household has four occupants and that each person in the household uses 100 gallons of water per day (Louisiana Department of Health and Hospitals). To ensure that water is available on an as needed basis, a peaking factor of two has been applied to the daily water consumption rate. Therefore, a value of 800 gpd has been established as the minimum yield for a potential domestic water supply.

(3) A yield of 800 gpd is approximately the median yield for an underground source of drinking water as defined by EPA (150-1440 gpd) (*Assistance on Compliance of 40 CFR Part 191 with Groundwater Protection Standards*, Memorandum, EPA, Office of Water, June 1993).

(4) If the limiting RS for the protection of an aquifer meeting the definition of Groundwater Classification 2 is less than the limiting RS for the protection of an aquifer meeting the definition of Groundwater Classification 1, then the aquifer shall be managed as a Groundwater Classification 1 aquifer.

Groundwater Classification 3

Class 3A: Groundwater within an aquifer that is sufficiently permeable to transmit water to a well at a maximum sustainable yield of less than 800 gpd;

or

Class 3B: Groundwater quality is such that it has a TDS concentration greater than 10,000 mg/l.

NOTE:

(1) If a domestic or agricultural water supply well is located within one mile of the AOI property boundaries and is screened in the same stratum as the aquifer of concern or has a direct hydraulic connection, then the aquifer shall be classified as a Groundwater Classification 2 aquifer.

(2) If the limiting RS for the protection of an aquifer meeting the definition of Groundwater Classification 3 is less than the limiting RS for the protection of an aquifer meeting the definition of Groundwater Classification 2, then the aquifer shall be managed as a Groundwater Classification 2 aquifer.

The Groundwater Classifications are illustrated in Figure 3.

2.11 Point of Exposure/Point of Compliance for Groundwater

The **point of exposure (POE)** for groundwater shall be the point in the aquifer where exposure to groundwater is occurring or may reasonably be expected to occur. The **point of compliance (POC)** for groundwater shall be the point in the aquifer where the groundwater RS is enforced and where groundwater monitoring takes place. A sampling location positioned as near to the source as feasible without causing an adverse impact to groundwater at which reproducible and representative samples can be withdrawn shall serve as the POC.

Based on site-specific conditions, the identification of more than one POC may be warranted. If the POE for one exposure pathway lies between the POC and POE for another exposure pathway, then the RS for both pathways shall be evaluated and if warranted, the RS and/or DF shall be adjusted such that the exposure levels are acceptable at the points of exposure for both pathways (e.g., if a POE for the inhalation of volatile emissions released from groundwater to the ambient air and/or a POE for the inhalation of volatile emissions released from groundwater to an enclosed structure lies between the POC and the POE for the application of a GW_3 RS, then the GW_3, DF3 or DAF3, GW_{es}, and GW_{air} RS shall be evaluated, and if warranted, adjusted so that the COC concentrations potentially reaching all identified POE are acceptable).

The POE and POC for GW_1 (and GW_{SS}), GW_2, and GW_3 are illustrated in Figure 9. The assumed points of exposure and the points of compliance for the groundwater classifications defined in Section 2.10 are as follows.

2.11.1 Groundwater Classification 1

The **POE** for an underground drinking water source meeting the criteria for Groundwater Classification 1 shall be assumed to be throughout the aquifer to be protected/restored.

The **POC** for the application of the groundwater SS (GW_{SS}) or limiting RS shall be a sampling location placed as near to the source as feasible without causing an adverse impact to groundwater at which reproducible and representative samples can be withdrawn. The groundwater SS or limiting RS shall be met throughout the aquifer to be protected/restored.

2.11.2 Groundwater Classification 2

In the absence of an on-site exposure point, the **POE** for an underground drinking water source meeting the criteria for Groundwater Classification 2 shall be assumed to be at the facility's property boundary (nearest to the source and/or downgradient of the source) or the nearest downgradient point off-site that could reasonably be considered for installation of a drinking water well within the aquifer to be protected/restored.

The **POC** for the application of the groundwater SS or limiting RS shall be a sampling location placed as near to the source as feasible without causing an adverse impact to groundwater at which reproducible and representative samples can be withdrawn. Appropriate and protective estimates of COC attenuation from the POC to the POE may be applied to the GW_2 RS prior to application at the POC.

2.11.3 Groundwater Classification 3

The **POE** for a groundwater source meeting the criteria for Groundwater Classification 3 shall be assumed to be at the potential point of discharge to the nearest downgradient surface water body within the aquifer to be protected/restored.

The **POC** for the application of the groundwater SS or limiting RS shall be a sampling location placed as near to the source as feasible without causing an adverse impact to groundwater at which reproducible and representative samples can be withdrawn. Appropriate and protective estimates of COC attenuation from the POC to the POE may be applied to the GW_3 RS prior to application at the POC. It should be noted that RECAP does not authorize the migration of COC offsite to adjacent property (but rather serves to evaluate the acceptability of constituent concentrations with respect to human health and the environment).

2.11.4 Groundwater Emissions to an Enclosed Structure

The **POE** for groundwater containing a volatile constituent located beneath an enclosed structure shall be assumed to be throughout the portion of the aquifer to be protected/restored that is located beneath, or expected to migrate beneath, the enclosed structure.

The **POC** for the application of the groundwater RS (GW_{es}) shall be a sampling location placed: 1) as near to the source as feasible without causing an adverse impact to groundwater; and 2) as near to the enclosed structure as possible at which reproducible and representative samples of the maximum constituent concentration beneath the enclosed structure can be withdrawn.

2.11.5 Groundwater Emissions to Ambient Air

The **POE** for shallow groundwater containing a volatile constituent shall be assumed to be throughout the aquifer to be protected/restored.

The **POC** for the application of the groundwater RS (GW_{air}) shall be a sampling location placed as near to the source as feasible without causing an adverse impact to groundwater at which reproducible and representative samples can be withdrawn.

2.12 Screening Standards and RECAP Standards

The methodologies and exposure assumptions used for the development of the SS and RS are consistent with current EPA guidelines [*Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual, Part A (RAGS-A)* (EPA 1989); *Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual, Part B Development of Risk-Based Preliminary Remediation Goals (RAGS-B)* (EPA 1991)*; Soil Screening Guidance (SSG)* (EPA 1996)*; Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Part E Supplemental Guidance Dermal Risk Assessment Interim Guidance* (EPA 1998); and *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (EPA 2001)]. For the development of the SS, MO-1 RS, and Appendix I RS, the toxicity values were obtained from the following hierarchy of references: (1) *Integrated Risk Information System (IRIS)* (EPA, http://www.epa.gov/iris/); (2) National Center for Environmental Assessment (NCEA) provisional values (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm); (3) *Health Effects Assessment Summary Tables (HEAST)* (EPA); or (4) withdrawn from IRIS or HEAST.

Refer to Appendix H for detailed guidance on: (1) the identification and application of the limiting SS or RS; and (2) methods for the development of the SS and RS. Refer to Figures 10 through 15 for illustrations on the development of the SS and SS. Refer to Figures 16 and 17 for the illustration of identifying applicable soil standards for surface soil and subsurface soil, respectively. Refer to Figures 18 and 19 for an illustration of the application of the soil and groundwater RS.

2.12.1 Soil Screening Standards for the SO

$Soil_{SSni}$ The $Soil_{SSni}$ represents a constituent concentration in soil that is protective of human health for non-industrial land use. The $Soil_{SSni}$ shall be obtained from Table 1. For a constituent not listed in Table 1, a $Soil_{SSni}$ shall be calculated in accordance with Appendix H. The exposure pathways addressed by the $Soil_{SSni}$ include the ingestion of soil, the inhalation of volatile emissions released from soil to the ambient air, and dermal contact with soil. Exposure assumptions representative of a RME scenario for non-industrial (residential) land use were applied. A risk-based standard was developed for both carcinogenic and noncarcinogenic health effects, and the lower of the two values was identified as the $Soil_{SSni}$. The $Soil_{SSni}$ is applicable to surface soil.

$Soil_{SSi}$ The $Soil_{SSi}$ represents a constituent concentration in soil that is protective of human health for industrial/commercial land use. The $Soil_{SSi}$ shall be obtained from Table 1. For a constituent not listed in Table 1, a $Soil_{SSi}$ shall be calculated in accordance with Appendix H. The exposure pathways addressed by the $Soil_{SSi}$ include the ingestion of soil, the inhalation of volatile emissions released from soil to the ambient air, and dermal contact with soil. Exposure assumptions representative of a RME scenario for industrial/commercial land use were applied. A risk-based standard was developed for both carcinogenic and noncarcinogenic health effects and the lower of the two values was identified as the $Soil_{SSi}$. The $Soil_{SSi}$ is applicable surface soil.

$Soil_{SSGW}$ The $Soil_{SSGW}$ represents a constituent concentration in soil that is not expected to result in the leaching of an unacceptable constituent concentration from soil to groundwater. The $Soil_{SSGW}$ serves to protect groundwater meeting the definition of Groundwater Classification 1 and is applicable to groundwater meeting the definition of Groundwater Classifications 1, 2, and 3. Thus, the $Soil_{SSGW}$ represents the constituent concentration in soil that will not result in a groundwater concentration that exceeds the GW_{SS}. As an alternative to applying the $Soil_{SSGW}$ at the AOI, the soil to groundwater pathway may be evaluated using the Synthetic Precipitation Leaching Procedure (SPLP) (refer to Appendix H). The soil to groundwater pathway shall be evaluated for surface soil and subsurface soil.

For the compilation of Table 1: (1) the noncarcinogenic $Soil_{SSi}$ and $Soil_{SSni}$ were based on a target hazard quotient of 0.1 and the carcinogenic $Soil_{SSi}$ and $Soil_{SSni}$ were based on a target risk level of 10^{-6}; (2) the $Soil_{SSni}$, $Soil_{SSi}$, and $Soil_{SSGW}$ were compared to the soil saturation concentration ($Soil_{sat}$) [for constituents that are in the liquid state at ambient temperature, i.e., those having a melting point less than or equal to 20°C (with the exception of the TPH fractions and mixtures)] and the lower of the two values was entered as the SS in Table 1. Therefore, $Soil_{sat}$ is not listed in Table 1 as a separate SS; and (3) if the $Soil_{SSni}$, $Soil_{SSi}$, or $Soil_{SSGW}$ was less than the analytical quantitation limit, the quantitation limit was entered in Table 1 as the SS.

2.12.2 Soil RECAP Standards for MO-1, MO-2, and MO-3

$Soil_{ni}$ The $Soil_{ni}$ represents a constituent concentration in soil that is protective of human health for non-industrial land use. The exposure pathways addressed by the $Soil_{ni}$ include the ingestion of soil, the inhalation of volatile emissions released from soil to the ambient air, and dermal contact with soil. Default exposure assumptions representative of a RME scenario for non-industrial (residential) land use shall be applied under MO-1 and MO-2. Site-specific RME assumptions approved by the Department shall be applied for non-industrial land uses under

MO-3. A risk-based standard shall be developed for both carcinogenic and noncarcinogenic health effects and the lower of the two values shall be identified as the $Soil_{ni}$. For MO-1, the $Soil_{ni}$ shall be obtained from Table 2. For a constituent not listed in Table 2, a $Soil_{ni}$ shall be calculated in accordance with Appendix H. Under MO-2 and MO-3, site-specific environmental fate and transport data may be used in the estimation of a site-specific volatilization factor (VF) (refer to Appendix H). The $Soil_{ni}$ is applicable to surface soil.

$Soil_i$ The $Soil_i$ represents a constituent concentration in soil that is protective of human health for industrial/commercial land use. The exposure pathways addressed by the $Soil_i$ include the ingestion of soil, the inhalation of volatile emissions released from soil to the ambient air, and dermal contact with soil. Default exposure assumptions representative of a RME scenario for industrial/commercial land use shall be applied under MO-1 and MO-2. Site-specific exposure data representative of a RME scenario and approved by the Department may be used under MO-3. A risk-based standard shall be developed for both carcinogenic and noncarcinogenic health effects, and the lower of the two values shall be identified as the $Soil_i$. For MO-1, the $Soil_i$ shall be obtained from Table 2. For a constituent not listed in Table 2, a $Soil_i$ shall be calculated in accordance with Appendix H. Under MO-2 and MO-3, site-specific environmental fate and transport data may be used in the estimation of a site-specific volatilization factor (VF) (refer to Appendix H). The $Soil_i$ is applicable to surface soil.

$Soil_{GW}$ The $Soil_{GW}$ represents a constituent concentration in soil that does not result in the leaching of an unacceptable constituent concentration from soil to groundwater. The $Soil_{GW}$ shall be based on the classification of the groundwater to be protected: **$Soil_{GW1}$** shall be based on the protection of groundwater meeting the definition of Groundwater Classification 1 (the $Soil_{GW1}$ shall not result in a groundwater concentration that exceeds the GW_1); **$Soil_{GW2}$** shall be based on the protection of groundwater meeting the definition of Groundwater Classification 2 (the $Soil_{GW2}$ shall not result in a groundwater concentration that exceeds the GW_2 at the POE); **$Soil_{GW3DW}$** shall be based on the protection of groundwater meeting the definition of Groundwater Classification 3 that may potentially discharge to a surface water body designated as a drinking water source (the $Soil_{GW3DW}$ shall not result in a groundwater concentration that exceeds the GW_{3DW} at the POE); and **$Soil_{GW3NDW}$** shall be based on the protection of groundwater meeting the definition of Groundwater Classification 3 that may potentially discharge to a surface water body designated as a non-drinking water source (the $Soil_{GW3NDW}$ shall not result in a groundwater concentration that exceeds the GW_{3NDW} at the POE). The $Soil_{GW2}$ shall be multiplied by a dilution and attenuation factor that accounts for the reduction in constituent concentration with groundwater migration from the source to the nearest downgradient property boundary. The $Soil_{GW3}$ shall be multiplied by a dilution and attenuation factor that accounts for the reduction in constituent concentration with groundwater migration from the source to the nearest downgradient surface water body. For MO-1, the $Soil_{GW}$

shall be obtained from Table 2 and the default dilution factor shall be obtained from Appendix H. For a constituent not listed in Table 2, a $Soil_{GW}$ shall be calculated in accordance with Appendix H. Under MO-2 and MO-3 site-specific environmental fate and transport data may be used to calculate a site-specific $Soil_{GW}$ RS and dilution and attenuation factor (refer to Appendix H). Refer to Section 2.10 for Groundwater Classification definitions, Section 2.11 for guidance on establishing the POC and POE, and Section 2.12.2 for GW_1, GW_2, GW_{3DW}, and GW_{3NDW} definitions. As an alternative to the $Soil_{GW}$ RS, the soil to groundwater pathway may be evaluated using a leach test (refer to Section H1.1 of Appendix H). The soil to groundwater pathway shall be evaluated for surface soil and subsurface soil.

$Soil_{es}$ The $Soil_{es}$ represents a constituent concentration in soil that does not result in an unacceptable constituent concentration in indoor air due to the actual or potential intrusion of volatile emissions from soil to indoor air within an enclosed structure. The $Soil_{es}$ shall be based on the protection of human health and shall be developed for the appropriate land use scenario (non-industrial or industrial/commercial). The exposure pathway addressed by the $Soil_{es}$ is the inhalation of volatile emissions released from soil to indoor air within an enclosed structure (refer to Section 2.1 for a definition of an enclosed structure). A risk-based $Soil_{es}$ standard shall be developed for both carcinogenic and noncarcinogenic health effects and the lower of the two values shall be identified as the $Soil_{es}$. The MO-1 $Soil_{es}$ RS are presented in Table 2. Under MO-2 and MO-3, site-specific environmental fate and transport data may be used in the development of the $Soil_{es.}$ The $Soil_{es}$ shall be calculated in accordance with Appendix H. In general, the $Soil_{es}$ is applicable to soil present at a depth less than or equal to 15 feet bgs that is impacted with volatile constituents and located beneath an enclosed structure. The applicability of the $Soil_{es}$ at an AOI shall be determined by the Department based on site-specific conditions and the level of concern associated with the potential release of volatile emissions from soil to an enclosed structure. As an alternative to the $Soil_{es}$ RS, the soil to indoor air pathway may be evaluated under MO-2 and MO-3 using soil gas sampling or indoor air sampling if approved by the Department (for further guidance on the evaluation of indoor air COC concentrations refer to Section B.2.5.12 of Appendix B and Section H1.1.3.5 of Appendix H). The acceptable indoor air concentration for vapor inhalation (C_a) shall be determined in accordance with Section H2.3 of Appendix H.

$Soil_{sat}$ The $Soil_{sat}$ concentration represents a chemical-physical limit where saturation of the soil occurs. A constituent concentration in soil at or above the $Soil_{sat}$ indicates the potential for NAPL to be present in the soil. The $Soil_{sat}$ parameter is only applicable to constituents present in a liquid phase at ambient temperatures (constituents with melting points greater than 20^oC). For MO-1, the $Soil_{sat}$ shall be obtained from Table 2. For a constituent not listed in Table 2, a $Soil_{sat}$ shall be calculated in accordance with Appendix H. The $Soil_{sat}$ may be calculated using site-specific environmental fate and transport data under MO-2 and MO-3 in accordance with Appendix H. The $Soil_{sat}$ is applicable to surface soil and subsurface soil.

For the compilation of Table 2: (1) the noncarcinogenic $Soil_i$ and $Soil_{ni}$ were based on a target hazard quotient of 1.0 and the carcinogenic $Soil_i$ and $Soil_{ni}$ were based on a target risk level of 10^{-6}; and (2) if the $Soil_{ni}$, $Soil_i$, or $Soil_{GW}$ was less than the analytical quantitation limit, the quantitation limit was entered in Table 2 as the RS.

2.12.3 Soil RECAP Standards for MO-2 and MO-3

$Soil_{ni}$-PEF The $Soil_{ni}$-PEF represents a constituent concentration in soil that is protective of human health for non-industrial land use. The exposure pathways addressed by the $Soil_{ni}$ include the ingestion of soil, the inhalation of volatile emissions released from soil to the ambient air, the inhalation of soil particulates, and dermal contact with soil. Default exposure assumptions representative of a RME scenario for non-industrial (residential) land use shall be applied. A risk-based standard shall be developed for both carcinogenic and noncarcinogenic health effects and the lower of the two values shall be identified as the $Soil_{ni}$-PEF. Site-specific environmental fate and transport data may be used in the calculation of the volatilization factor (VF) and the particulate emission factor (PEF) in accordance with Appendix H. The $Soil_{ni}$-PEF is applicable to surface soil at an AOI with unusually high fugitive dust emissions (an AOI that does not have ground cover, an AOI that includes uncovered soil piles, an AOI that includes heavily traveled unpaved roads, etc.).

$Soil_i$-PEF The $Soil_i$-PEF represents a constituent concentration in soil that is protective of human health for industrial/commercial land use. The exposure pathways addressed by the $Soil_i$-PEF include the ingestion of soil, the inhalation of volatile emissions released from soil to the ambient air, the inhalation of soil particulates, and dermal contact with soil. Default exposure assumptions representative of a RME scenario for industrial/commercial land use shall be applied. A risk-based standard shall be developed for both carcinogenic and noncarcinogenic health effects and the lower of the two values shall be identified as the $Soil_i$-PEF. Site-specific environmental fate and transport data may be used in the calculation of the volatilization factor (VF) and the particulate emission factor (PEF) in accordance with Appendix H. The $Soil_i$-PEF is applicable to surface soil at an AOI with unusually high fugitive dust emissions (an AOI that does not have ground cover, an AOI that includes uncovered soil piles, an AOI that includes heavily traveled unpaved roads, etc.).

2.12.4 Groundwater Screening Standard for the SO

GW_{SS} The GW_{SS} serves to protect groundwater meeting the definition of Groundwater Classifications 1, 2, and 3. The GW_{SS} represents a constituent concentration in groundwater that is protective of human health. The GW_{SS} shall be obtained from Table 1. For a constituent not listed in Table 1, the Safe

Drinking Water Act (SWDA) Maximum Contaminant Level (MCL) shall be identified as the GW_{SS}. If an MCL is not available, then a risk-based standard shall be developed in accordance with Appendix H. If an MCL listed in Table 1 is revised by the EPA, the revised value shall serve as the GW_{SS}. The exposure pathways addressed by the GW_{SS} include the ingestion of groundwater and the inhalation of volatile emissions associated with indoor groundwater use. Exposure assumptions representative of a non-industrial (residential) RME scenario shall be applied. A risk-based standard was developed for both carcinogenic and noncarcinogenic health effects and the lower of the two values was identified as the GW_{SS}. The GW_{SS} is applicable to groundwater meeting the definitions of Groundwater Classifications 1, 2, and 3. A dilution and attenuation factor shall **not** be applied to the GW_{SS}.

For the compilation of Table 1, the GW_{SS} was compared to the water solubility ($Water_{sol}$) and the lower of the two values was entered in Table 1 as the GW_{SS}. Therefore, $Water_{sol}$ is not listed as a separate SS in Table 1. If the GW_{SS} was less than the analytical quantitation limit, the quantitation limit was entered in Table 1 as the GW_{SS}.

2.12.5 Groundwater RECAP Standards for MO-1, MO-2, and MO-3

GW_1 The GW_1 serves to protect groundwater meeting the definition of Groundwater Classification 1. The GW_1 represents a constituent concentration in groundwater that is protective of human health. The GW_1 shall be obtained from Table 3. For a constituent not listed in Table 3, the SDWA MCL shall serve as the GW_1. If a MCL listed in Table 3 is revised by the EPA, the revised value shall serve as the GW_1 RS. If a MCL is not available, then a risk-based GW_1 shall be developed in accordance with Appendix H. The exposure pathways addressed by the GW_1 include the ingestion of groundwater and the inhalation of volatile emissions associated with indoor groundwater use. Default exposure assumptions representative of a non-industrial (residential) RME scenario shall be applied. A risk-based standard shall be developed for both carcinogenic and noncarcinogenic health effects and the lower of the two risk-based values shall be identified as the GW_1. The GW_1 RS is applicable to groundwater meeting the definition of Groundwater Classification 1 (refer to Section 2.10 for the Groundwater Classifications).

GW_2 The GW_2 serves to protect groundwater meeting the definition of Groundwater Classification 2. The GW_2 represents a constituent concentration that is protective of human health. The GW_2 shall be obtained from Table 3. For a constituent not listed in Table 3, the SDWA MCL shall serve as the GW_2 RS. If a MCL listed in Table 3 is revised by the EPA, the revised value shall serve as the GW_2 RS. If a MCL is not available, then a risk-based GW_2 shall be developed in accordance with Appendix H. The exposure pathways addressed by the risk-based GW_2 include the ingestion of groundwater and the inhalation of volatile emissions associated with indoor groundwater use. Exposure assumptions representative of a non-industrial (residential) RME scenario were applied. A risk-based standard shall be developed for both carcinogenic and noncarcinogenic health effects, and the lower of the two values was identified as the GW_2. The GW_2 shall be multiplied by a dilution and attenuation factor that accounts for the reduction in constituent concentration with groundwater migration from the source to the nearest downgradient property boundary (POE). For MO-1, the default dilution factor (DF2) shall be obtained from Appendix H. Under MO-2 and MO-3, site-specific environmental fate and transport data may be used to calculate a site-specific dilution and attenuation factor (DAF2) (refer to Appendix H). A GW_2 standard shall not result in a constituent concentration in groundwater that poses unacceptable health risk for other pathways of exposure such as the inhalation of volatile emissions released from groundwater to ambient air or the inhalation of volatile emissions released from groundwater to an enclosed structure. This standard does not authorize the migration of COC offsite to adjacent property but rather serves to evaluate the acceptability of constituent concentrations with respect to human health and the environment. The GW_2 RS is applicable to groundwater meeting the definition of Groundwater Classification 2 (refer to Section 2.10 for the Groundwater Classifications and Section 2.11 for guidance on establishing the POC and POE).

GW_3 The GW_3 serves to protect groundwater meeting the definition of Groundwater Classification 3. The GW_3 represents a constituent concentration in groundwater that will not result in the cross-media transfer of a constituent from groundwater to a downgradient surface water body. The GW_3 shall be obtained from Table 3. For a constituent not listed in Table 3, the surface water criterion (LAC 33:IX.1113) for the protection of human health shall serve as the GW_3. The human health protection criterion shall be identified based on the use classification of the surface water body (segment or subsegment) to be protected. If a constituent is not listed in LAC 33:IX.1113, then a GW_3 shall be calculated in accordance with Appendix H. The **GW_{3DW}** shall be based on the protection of a downgradient surface water that is classified as a drinking water source. The **GW_{3NDW}** shall be based on the protection of a downgradient surface water that is classified as a non-drinking water source. The GW_{3DW} or the GW_{3NDW} shall be multiplied by a dilution and attenuation factor that accounts for the reduction in constituent concentration with groundwater migration from the source to the nearest downgradient surface water body (POE). For MO-1, the default dilution factor (DF3) shall be obtained from Appendix H. Under MO-2 and MO-3, site-specific environmental fate and transport data may be used to calculate a site-specific dilution and attenuation factor (DAF3) (refer to Appendix H). Refer to Section 2.11 for guidance on establishing the POC and POE). The objective of the GW_3 RECAP standard is to provide protection against the migration and discharge of a COC via groundwater to a surface water body. It is **not** the intent of this standard to allow the discharge of a COC to surface water. This standard does not authorize the migration of COC offsite to adjacent property but rather serves to evaluate the acceptability of constituent concentrations with respect to human health and the environment. A GW_3 standard shall not result in a constituent concentration in groundwater that poses unacceptable health risk for other pathways of exposure such as the inhalation of volatile emissions released from groundwater to ambient air or the inhalation of volatile emissions released from groundwater to an enclosed structure.

$Water_{sol}$ The $Water_{sol}$ represents a chemical-physical limit where saturation of the water occurs. Constituent concentrations in water at or above the water solubility limit indicate a potential for NAPL to be present. The $Water_{sol}$ value shall be obtained from Table 3. For a constituent not listed in Table 3, the $Water_{sol}$ shall be obtained from EPA's *Superfund Chemical Data Matrix* or other published technical reference. Refer to Appendix H for the recommended hierarchy of sources for obtaining chemical-specific data.

GW_{es} The GW_{es} represents a constituent concentration in groundwater that does not result in an unacceptable constituent concentration in indoor air due to the actual or potential intrusion of volatile emissions from groundwater to an enclosed structure (refer to Section 2.1 for a definition of enclosed structure). The GW_{es} is protective of human health and shall be developed for the appropriate land use scenario (non-industrial or industrial/commercial). The exposure pathway addressed by the GW_{es} is the inhalation of volatile emissions released from groundwater to indoor air within an enclosed structure. The GW_{es} respresents the constituent concentration in groundwater that corresponds to an acceptable vapor concentration in the indoor air of the enclosed structure. The MO-1 GW_{es} RS are presented in Table 3. Under MO-2, default exposure assumptions representative of a RME scenario shall be applied. Under MO-3, Department-approved site-specific exposure data may be used in the development of the GW_{es}. Under MO-2 and MO-3, site-specific environmental fate and transport data may be used in the development of the GW_{es}. A risk-based standard shall be developed for both carcinogenic and noncarcinogenic health effects and the lower of the two values shall be identified as the GW_{es}. The GW_{es} shall be calculated in accordance with Appendix H. Refer to Section 2.11 for guidance on establishing the POE and POC for the groundwater to enclosed structure pathway. In general, the GW_{es} is applicable to groundwater present at a depth less than or equal to 15 feet bgs that is impacted with a volatile constituent and located beneath (or expected to migrate beneath) an enclosed structure. The applicability of the GW_{es} at an AOI shall be determined by the Department based on site-specific conditions and the level of concern associated with the potential release of volatile emissions from groundwater to an enclosed structure. As an alternative to applying a GW_{es} RS at the AOI, the groundwater to indoor air pathway may be evaluated under MO-2 and MO-3 using soil gas sampling or indoor air sampling if approved by the Department (for further guidance on the evaluation of indoor air COC concentrations refer to Section B.2.5.12 of Appendix B and Section H1.2.3.5 of Appendix H). The acceptable indoor air concentration for vapor inhalation (C_a) shall be determined in accordance with Section H2.3 of Appendix H.

GW_{air} The GW_{air} represents a constituent concentration in groundwater that does not result in an unacceptable constituent concentration in ambient air due to the actual or potential release of volatile emissions from groundwater to the ambient air. The exposure pathway addressed by the GW_{air} is the inhalation of volatile emissions released from groundwater to outdoor air. The MO-1 GW_{air} RS are presented in Table 3. Under MO-2, default exposure assumptions representative of a RME scenario shall be applied. For MO-3, Department-approved site-specific RME data may be used. Under MO-2 and MO-3, site-specific environmental fate and transport data may be used in the development of the GW_{air}. A risk-based standard shall be developed for both carcinogenic and noncarcinogenic health effects and the lower of the two values shall be identified as the GW_{air}. In general, the GW_{air} is applicable to groundwater present at a depth less than or equal to 15 feet bgs that is impacted with a volatile constituent. The applicability of the GW_{air} at an AOI shall be determined by the Department based on site-specific conditions and the level of concern associated with the potential release of volatile emissions from groundwater to ambient air. As an alternative to applying a GW_{air} RS at the AOI, the groundwater to ambient air pathway may be evaluated using air monitoring if approved by the Department. The acceptable ambient air concentration for vapor inhalation (C_a) shall be determined in accordance with Section H2.3 of Appendix H.

2.12.6 RECAP Standards for Other Media and/or Exposure Pathways for MO-3

Site-specific RS shall be developed for other media (air, surface water, sediments, biota, etc.) and/or exposure pathways as warranted by site conditions.

2.13 Identification of a Background Concentration

A background concentration is defined as the concentration of a constituent present in an environmental medium that is distinguishable from an identifiable source concentration. An evaluation of the background conditions at an AOI is warranted when a COC that is found to pose a risk to human health or the environment is thought to be attributable to naturally-occurring background concentrations of the COC. The background concentration may be used: (1) to distinguish site-related constituent concentrations from naturally-occurring constituent concentrations, i.e., in the identification of site-related COC; and (2) as a default SS or RS when the limiting SS or RS is less than the naturally-occurring background concentration. The background concentration applied at an AOC or an AOI for these purposes shall be: (1) a State-specific concentration established by the Department; or (2) a site-specific concentration based on sample collection/analysis by the Submitter and approved by the Department. State-specific background concentrations may be developed for frequently encountered constituents pursuant to this regulation. The State-specific background concentrations shall serve as SO SS and MO-1 RS and shall be listed in Tables 1-3. In the absence of a Department-derived, State-specific, background concentration, the background concentration shall be established via the collection and analysis of background samples obtained from an area within the vicinity of the AOC or the AOI that has not been impacted by site activities (or other contaminant source) and that shares the same basic characteristics as the medium of concern. Background samples shall be collected for each medium of concern. The need, and required level of effort, for background characterization shall be determined on a site-specific basis. Sampling considerations for establishing background include the natural variability of metals, operational practices, source characteristics, constituent mobility, soil type, sample number, and sample locations. Soil background samples shall be collected from similar depths and soil types which shall be consistent with the depths and soil types in which the maximum levels of COC are found within the AOI. An insufficient number of background samples, inappropriate background sample locations, unknown or suspect data quality, alterations in the land (excavation, filling, new sources, etc.) since data collection, and gaps in the available data will result in the need for further background characterization. Regional or local background data from published sources may be used for qualitative analyses of site conditions but shall not be used in a quantitative manner to evaluate site-specific background conditions. If a COC is not naturally-occurring or the COC concentrations present at the AOI are not suspected to be greater than background concentrations, characterization of background conditions is not warranted.

A minimum dataset consisting of 4 discrete samples shall be required to establish a site-specific background concentration for soil. For a dataset consisting of 7 or fewer discrete samples, the arithmetic mean constituent concentration (unless skewed due to sample bias) shall be used to define the background concentration at the AOC or the AOI. For a dataset consisting of 8 or more discrete samples, the arithmetic mean constituent concentration (unless skewed due to sample bias) plus one standard deviation shall be used to define the background concentration at the AOC or AOI as presented below. (Note: the mean concentration plus one standard deviation shall be used to estimate background concentrations only and shall not be used for the estimation of the AOIC.)

1. Calculate the mean background concentration (BG_μ):

$$BG_\mu = (BG_1 + BG_2 + BG_3 \ldots BG_n)/n$$

2. Calculate the background variance (BG_s^2) by taking the sum of the squares of each reading minus the mean and dividing by the degrees of freedom (the total number of background samples minus 1):

$$BG_s^2 = [(BG_1 - BG_\mu)^2 + (BG_2 - BG_\mu)^2 + \ldots (BG_n - BG_\mu)^2]/n\text{-}1$$

3. Calculate the background standard deviation (BG_σ) by taking the square root of the variance:

$$BG_\sigma = (BG_s^2)^{1/2}$$

4. Evaluate the distribution of the background data using the Coefficient of Variation Test (CV) where:

$$CV = BG_{\sigma} / BG_{\mu}$$

The CV should not exceed 1. If the data distribution exceeds a CV of 1, then the data should be evaluated to determine the source of the variability. If the data evaluation indicates that a data point does not accurately represent background concentrations, the outlier data point may be excluded or additional background data points may be collected to ensure the dataset used to estimate the background concentration is truly representative of background conditions.

5. Calculate the upper limit of the background data as follows:

$$BG = BG_{u} + BG_{\sigma}$$

The site-specific background concentration (BG) is subject to Department approval prior to application at the AOI. A BG value based on a background data set characterized by high variability or skewed due to one or more outlier values shall not be approved by the Department if it is questionable that the data are truly representative of background conditions. Statistical methods used to establish background concentrations are subject to Department approval.

To determine if a constituent is site-related or attributable to natural background, compare the BG calculated in Step 5 to the arithmetic mean constituent concentration (**not** the 95%UCL-AM constituent concentration) detected within the AOI:

If the AOI arithmetic mean constituent concentration is less than or equal to the BG, then the presence of the constituent at the AOI shall be considered to be attributable to background and shall not be identified as a COC.

If the AOI arithmetic mean constituent concentration is greater than the BG, then the constituent shall be identified as a COC and included in the RECAP assessment.

In the event a limiting SS or limiting RS is less than the background concentration, the background concentration (determined as described above) shall be used as the default limiting SS or RS. A background concentration used as a default SS or RS shall receive Department approval prior to application at the AOC or the AOI. The background concentration shall not be used as a SS or RS in the event the Department determines that the background concentration for a COC poses an unacceptable acute or chronic risk to human health or the environment for current or future land use. The background concentration shall not be subtracted from the reported concentration(s) at the AOI.

2.14 Acceptable Risk Levels

Acceptable risk levels for site management decisions under the SO, MO-1, MO-2, and MO-3 shall be determined in accordance with the following guidelines.

2.14.1 Target Risk Levels

Carcinogenic Health Effects. The total cumulative cancer risk estimate for an AOI shall not exceed the target risk level (1E-06 to 1E-04) approved by the Department for the Option being implemented. The total cumulative cancer risk shall include all COC and exposure pathways identified for each receptor population and shall be estimated as follows: Total Risk = $[(AOIC_1/RS_1) + (AOIC_2/RS_2) + \ldots + (AOIC_i/RS_i)] \times 10^{-6}$. If the total cumulative cancer risk estimate exceeds the target risk, then typically, corrective action shall be warranted. Carcinogenic COC, exposure pathways, and media screened out under previously completed Options shall not be included in the calculation of the total cumulative cancer risk for the Option currently being implemented at the AOI.

Screening Standards and RECAP Standards shall be based on a target cancer risk of 10^{-6} in accordance with EPA guidelines and policy (*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual Part B Development of Risk-Based Preliminary Remediation Goals,* EPA 1991*; Soil Screening Guidance,* EPA 1996*; Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites,* EPA 2001; *Role of Baseline Risk Assessment in Superfund Remedy Selection Decisions,* EPA 1991; NCP 40 CFR 300.430(e)(2); *Risk-based Concentration Tables,* EPA Region III; EPA Region IV; *Human Health Medium-Specific Screening Levels*, EPA Region VI; and *Preliminary Remediation Goals* EPA Region IX. For carcinogens, it is generally assumed that setting a 10^{-6} target risk level for individual constituents and pathways will result in a total cumulative cancer risk that is within the acceptable risk range of 10^{-6} to 10^{-4} (*Soil Screening Guidance*, EPA 1996). Under MO-3, an alternate target risk level may be approved by the Department for the development of site-specific MO-3 RS if warranted by site-specific conditions. An alternate target cancer risk level will only be considered acceptable for the development of site-specific MO-3 RS when it can be demonstrated that the total cumulative cancer risk for a RME scenario is less than or within the target range of 10^{-6} to 10^{-4}. The use of a target cancer risk level above 10^{-6} shall be justified based on site-specific conditions, the level of certainty in the nature and extent of impact (level of certainty in the site characterization and analytical data), the level of certainty in the nature and extent of exposure, the level of confidence in the risk assessment results, and technical factors. Other considerations include compliance with ARAR, cumulative effect of multiple COC, the potential for human exposure from other pathways at the AOC or the AOI, population sensitivities, potential impacts on environmental receptors, cross-media impacts, financial assurance/commitment, future site use, the reliability of alternatives, the weight-of-scientific evidence concerning exposures, quantitation limits for the COC, technical limitations to remediation, the ability to monitor and control movement of COC, and background levels of COC. The Department has a preference for site management decisions that meet the more protective end of the target range (i.e., 10^{-6}). For an AOI where a total cumulative risk level above 10^{-6} is deemed acceptable by the Department, the risks associated with all carcinogens detected on-site shall be considered in the estimation of: (a) cumulative cancer risks; and (b) cumulative risks associated with residual constituent concentrations following corrective action to document that the total cumulative cancer risk is at or below 10^{-4}. It should be noted that corrective action may be warranted even if the cancer risk is within the target range if: (a) a chemical-specific standard that defines acceptable risk (ARAR) is exceeded; (b) the potential for noncarcinogenic adverse health effects is unacceptable (HI > 1.0); (c) an adverse environmental impact has occurred or may occur; and/or (d) ecological risks are unacceptable.

Noncarcinogenic Health Effects. The total hazard index (THI) for each critical effect/target organ shall not exceed a target hazard index of 1.0 in accordance with EPA guidelines (*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual*, *Part B - Development of Risk-Based Preliminary Remediation Goals,* EPA 1991*; Soil Screening Guidance,* EPA 1996). A target hazard quotient of 1.0 corresponds to an acceptable exposure level for exposure to a single constituent via a single medium. Therefore, a RECAP Standard based on a target hazard quotient of 1.0 represents an acceptable exposure concentration for exposure to a single constituent via a single medium. If multiple COC or impacted media are present, the RECAP standards based on noncarcinogenic health effects must be evaluated for potential additive health effects and if warranted adjusted so that the total hazard index for each critical health effect/target organ is less than or equal to 1.0. Refer to Appendix G for guidance on adjusting RECAP standards to account for additive health effects. RECAP Screening Standards are based on a target hazard quotient of 0.1 and therefore do not require adjustment when multiple COC or impacted media are present. The hazard index (HI) for each critical health effect/target organ shall include all COC and exposure pathways identified for the Option being implemented and shall be determined as follows: $HI = [(AOIC_1/RS_1) + (AOIC_2/RS_2) +\ldots+ (AOIC_i/RS_i)]$. To determine the total hazard index for each critical health effect/target organ (THI), the HI for all impacted media to which a receptor is simultaneously exposed shall be summed. If the HI for a given critical effect exceeds 1.0, then typically, corrective action shall be warranted. Media, COC, and exposure pathways screened out under Options previously completed shall not be included in the calculation of the total hazard index for the Option currently being implemented at the AOI. It should be noted that corrective action may be warranted even if the total hazard index for a critical health effect/target organ is less than or equal to 1.0 if: (a) a chemical-specific standard that defines acceptable risk is exceeded; (b) carcinogenic effects are unacceptable; (c) an adverse environmental impact has occurred or may occur; and/or (d) ecological risks are unacceptable.

2.14.2 Applicable or Relevant and Appropriate Requirements

When an Applicable or Relevant and Appropriate Requirement (ARAR) for a specific constituent defines an acceptable level of exposure, compliance with the ARAR shall typically be considered protective even if it is outside the risk range (unless there are extenuating circumstances such as exposure to multiple constituents, exposure via multiple pathways, or exposure to more than one medium) (*Memorandum: Role of Baseline Risk Assessment in Superfund Remedy Selection Decision*, EPA 1991). Examples of ARAR that may be considered acceptable for use under the RECAP include primary drinking water standards (MCL) (SDWA), secondary drinking water standards, federal ambient water quality criteria; national ambient air quality standards (NAAQS);

Louisiana Water Quality Standards, and Louisiana Air Quality Standards. The use of an ARAR under the RECAP is subject to Department approval.

2.14.3 Background Concentrations and Quantitation Limits

If deemed appropriate by the Department based on current and future land use, compliance with a Department-approved background concentration (refer to Section 2.13) or Department-approved analytical quantitation limit shall be considered to be acceptable even if the associated risk is outside the target cancer risk range or if the hazard index is greater than 1.0 for that COC. A RS based on a background concentration or quantitiative limit shall not be adjusted to account for additive health effects.

2.14.4 Acute Health Risks

It should be noted that for residential land use, acute toxicity may be a concern for a child receptor engaging in soil pica (25-60 gm/day) at COC (barium, cadmium, copper, cyanide, fluoride, nickel, phenol, vanadium, and lead) concentrations equal to the SS or RS which are based on the protection of chronic health effects (Calabrese, et. al.1997). If warranted, the SS and/or RS shall be adjusted downward to be protective of acute health effects potentially associated with soil pica for the child receptor.

2.14.5 Ecological Risks

An ecological checklist should be completed for each AOI. If an ecological risk assessment is determined to be warranted, it shall be conducted in accordance with Section 7.0. If the hazard quotient method is used for the assessment of ecological risks, acceptable risk shall be a defined as a hazard index of less than or equal to 1.0. If unacceptable environmental/ecological risks are determined to be associated with constituent concentrations at an AOI (refer to Section 7.0), corrective action shall be warranted even if there is no significant risk to human health.

2.15 Identification of Toxicity Values

Noncarcinogenic Health Effects. The toxicity values used to assess noncarcinogenic health effects under the RECAP include oral reference doses (RfD_o) and reference concentrations (RfC). For use in the calculation of soil and groundwater SS and RS, the RfC must be converted from units of mg/m^3 (acceptable concentration in air) to mg/kg-day (inhalation RfD) by dividing the RfC by 70 kg (an assumed body weight) and multiplying by 20 m^3/day (an assumed inhalation rate). The critical effect(s) identified by EPA as the basis for the development of the RfD and RfC shall be identified for each COC (that elicits noncarcinogenic health effects) included in the MO-1, MO-2, or MO-3 assessment.

Carcinogenic Health Effects. The toxicity values used to assess carcinogenic health effects under RECAP include slope factors (SF) and inhalation unit risk values. For use in the calculation of SS and RS, the inhalation unit risk must be converted from units of risk per ug/m^3 to risk per mg/kg-day (inhalation SF) by multiplying the inhalation unit risk by 70 kg (an assumed body weight) and dividing by 20 m^3/day * 10^{-3} ug/mg (an assumed inhalation rate). The weight-of-evidence classification accompanying the oral slope factor and inhalation unit risk value shall be identified for each carcinogenic COC included in the MO-1, MO-2, or MO-3 assessment. The oral slope factor and inhalation unit risk value for continuous lifetime exposure during adulthood shall be used to develop SS and RS for industrial/commercial land use. The oral slope factor and inhalation unit risk value for continuous lifetime exposure from birth shall be used to develop SS and RS for nonindustrial (residential) land use. For polychlorinated biphenyls (PCB), the upper bound slope factor shall be selected based on the medium and exposure pathway under evaluation and the degree of chlorination of the PCB congeners of concern. For polycyclic aromatic hydrocarbons, slope factors shall be developed for the carcinogenic constituents using the SF for benzo(a)pyrene and the appropriate toxicity equivalent factor (TEF) (refer to Appendix D). Polychlorinated dibenzodioxins and dibenzofurans, shall be evaluated in accordance with the guidelines in Appendix D.

Identification of Toxicity Values. The RfD, RfC, SF, and inhalation unit risk value used under RECAP shall be obtained from the following hierarchy of sources: (1) EPA's *Integrated Risk Information System* (*IRIS*) (http://www.epa.gov/iris/); (2) EPA's National Center for Environmental Assessment (NCEA) provisional values (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm); (3) EPA's *Health Effects Assessment Summary Tables* (EPA); (4) withdrawn from IRIS or HEAST; or (5) other EPA or EPA-recommended source. The RfD for the evaluation of total petroleum hydrocarbons shall be obtained from Appendix D. Surrogate RfD for select PAH constituents are presented in Appendix D. Toxicity values used in the development of SS or RS shall be presented in the RECAP submittal along with the critical effect for noncarcinogenic health effects, EPA carcinogenic classification for the carcinogenic health effects, and reference(s).

Route-to-Route Extrapolation. EPA toxicity values for the **dermal** route of exposure are not available. The oral toxicity values shall be used for the dermal route of exposure with the exception of cadmium. For cadmium, the oral RfD shall be converted to a dermal RfD by multiplying the oral RfD by an oral absorption efficiency of 0.05 (Appendix A of *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual*, EPA 1989; *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance Dermal Risk Assessment Interim Guidance*, EPA 2000). For a constituent lacking an **inhalation** toxicity value: (1) for the SO and MO-1: the oral toxicity value may be used to evaluate the inhalation route; or (2) for MO-2 and MO-3: route-to-route extrapolation may be performed using EPA-approved methods. Route-to-route extrapolation methods shall account for the relationship between physical/chemical properties and absorption and distribution of the toxicant, the significance of portal-of-entry effects, and the potential differences in metabolic pathways associated with the intensity and duration of inhalation exposure. Toxicity values derived via a route-to-route extrapolation shall be identified in the RECAP submittal and are subject to Department approval. For the generation of Tables

1, 2, and 3: (1) the oral toxicity value was used to assess the dermal route of exposure; (2) the oral toxicity value was used to assess the inhalation route of exposure in the absence of an inhalation toxicity value.

Toxicity Values Not Available. If an EPA toxicity value is not available for a COC, the Submitter may: 1) refer to the Department for a surrogate toxicity value; 2) develop a toxicity value using current EPA methodology if adequate toxicological data are available; or 3) identify a surrogate toxicity value based on similarities in physical/chemical properties, critical effects, mechanism of action, and toxicokinetics. A toxicity value developed by the Submitter or a surrogate toxicity value identified by the Submitter shall receive approval from the Department **prior** to the use of the value in a RECAP assessment. To receive approval, the methods used for the development/identification of the toxicity value shall be documented, referenced, and consistent with current EPA guidelines. The supporting documentation shall contain a comprehensive toxicity profile including systems, critical effects and mechanisms of toxicity; the concentrations at which adverse effects are expected to occur in humans; absorption efficiency for relevant routes of exposure; and a brief description of the overall toxicological database available and the level of confidence associated with the database. References for toxicity values and toxicological data cited shall be included in the report. Toxicity values are not available for lead. Lead shall be evaluated in accordance with Appendix D.

If a toxicity value presented in the RECAP document is revised by the EPA: 1) the SS and MO-1 RS shall **not** be re-calculated using the revised toxicity value; and 2) the MO-2 and MO-3 RS shall be calculated using the revised toxicity value.

If the toxicity of a COC is dependent on the speciation/isomer present and speciation/isomer data is not available, then it shall be assumed that the most toxic speciation/isomer of the COC is present at the AOI.

2.16 Monitored Natural Attenuation

Monitored natural attenuation is defined as the biodegradation, dispersion, dilution, sorption, volatilization, and/or chemical and biochemical transformation/stabilization of constituents to effectively reduce constituent concentration, toxicity, mobility, mass, or volume to levels that are protective of human health and the ecosystem (USEPA ORD, OSWER). Monitored natural attenuation may be applied as a stand alone remedial process or included as a unit operation of a remedial process. It should be evaluated and compared to other remedial processes to determine which is the most appropriate process for a site. As with any remedial process, monitored natural attenuation should be selected only where it can meet all of the remedial goals for the site and where it can obtain those goals in an appropriate timeframe. An appropriate timeframe is one that is reasonable compared to that offered by other remedial methods. To ensure that the timeframe estimates are comparable, the assumptions used in each treatment proposal evaluated are to be consistent ["*Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*" (OSWER Directive Number 9200.4-17P)]. Unless otherwise approved by the Department, the criteria presented in Sections 2.16.1, 2.16.2, and 2.16.3 should be followed for monitored natural attenuation plans submitted to the Department.

2.16.1 Evidence to Support Monitored Natural Attenuation

Monitored natural attenuation of COC impacting soil and/or groundwater may be allowed as a remedial alternative when it has been demonstrated to the Department that the COC, under site-specific conditions, will naturally attenuate to the appropriate RS without causing adverse impacts. Department requirements for a monitored natural attenuation program shall include adequate evidence to support a determination that:

1) All sources of COC have been controlled and NAPL has been removed/controlled to the extent of technical practicability;

2) The plume has reached declining conditions and the area of constituent concentrations above SS is not expanding;

3) Constituents are susceptible to natural degradation processes;

4) Constituent concentrations reaching human or ecological receptors do not result in unacceptable risks (refer to Section 2.14); and

5) Conditions are favorable for degradation and/or natural attenuation of the COC (This shall include documentation of the constituent(s)' degradability and/or attenuation capacity and identification and discussion of site-specific characteristics which support natural attenuation. Monitoring results shall be submitted which demonstrate that site-specific conditions are conducive to the natural processes of degradability and/or attenuation).

2.16.2 Contingency Plan

A contingency remedial plan shall be included with the *Evidence to Support Monitored Natural Attenuation* in the event that the natural attenuation remedy fails to achieve the remedial goals. The contingency plan may be an assessment of the AOI under a higher tier (MO-1, MO-2, or MO-3) or actions that will be taken to develop and implement an active remediation program.

If the Department, at any time, determines that: (1) a COC being monitored under a natural attenuation compliance program has the potential to migrate to a human or ecological receptor above the applicable RS; (2) COC concentrations are not decreasing; (3) applicable RS will not be reached within a reasonable timeframe; or (4) in any way fails to achieve the remedial goals of the program within a reasonable timeframe, then the contingency plan shall be implemented. The Department may require the use of institutional controls as a condition to the approval of a natural attenuation compliance program when necessary to protect current or future use.

2.16.3 Documentation of the Effectiveness of Monitored Natural Attenuation

A plan to evaluate the progress of the remedy shall be included. This plan must provide specifics on sampling points, sampling methods, sampling frequency, analytical parameters, analytical methods, and Quality Assurance/Quality Control procedures.

The following specific requirements for groundwater are to be addressed in the plan:

1) The establishment of a sentinel monitoring well system for impacted groundwater designed to detect a COC in groundwater prior to reaching any potential human or ecological receptor. This system shall be located between the impacted plume and the human or ecological receptor at a point at least 2-years travel time upgradient of the exposure point(s) unless otherwise approved by the Department;

2) A POC monitoring well network sufficient to document reduction of contaminant concentrations at the source and for confirmation of attainment of RECAP standards at the POC; and

3) A network of monitoring wells extending from the source area down-gradient to the leading edge of the plume. These wells should be located near the mid-line of the plume in order to evaluate spatial and temporal variation of the plume and obtain geochemical data documenting that NA is occurring and to document specific processes occurring.

The plan is to state when reports shall be issued addressing the following items as deemed to be appropriate for site-specific conditions:

1) The treatment pathways and processes including potential byproducts of the COC;

2) The rate of treatment for each COC and for any byproducts;

3) The usage rate of electron acceptors and any related geochemical parameters that contribute to the natural attenuation process;

4) The treatment mass balance for each COC, any byproducts, and related electron acceptors;

5) Isopleths for each COC, electron acceptors, and byproducts; and

6) In some cases, microbiological laboratory data supporting degradation and decay rates.

2.16.4 Determination of the Biodegradation Rate and Retardation Factor

The biodegradation rate and retardation factor used in fate and transport modeling must be derived from site-specific monitored natural attenuation data. It is not the intent of this sub-section to outline a step-by-step procedure of how to derive these parameters, but to provide a general overview of the type of basic information required to justify these parameters. Additional information on how to confirm and quantify biodegradation may be obtained from the "*Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water,*" EPA/600/R-98/128 or "*Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater,*" Air Force Center for Environmental Excellence Technology Transfer Division 03/08/99.

The biodegradation rate can be derived using isopleths developed from site monitoring data. The isopleths are to include the COC, tracer, electron acceptors, and metabolic byproducts. The tracer is a chemical that is unaffected by biodegradation and may be inherent to the site. The contaminant concentration is to be normalized for advection, dispersion, dilution, and sorption. (Microcosms can be used to determine that biodegradation is occurring at a site but cannot be substituted for field data.)

The retardation factor by definition is the advective velocity of the groundwater divided by the advective velocity of the contaminant. The advective velocity of the groundwater can be derived from properties collected from pumping tests or slug tests and soil physical data obtained from the borehole. The advective velocity of the contaminant can be derived using contaminant iso-concentration drawings developed from site monitoring data. This method of deriving the retardation assumes that biodegradation is not occurring. If retardation and biodegradation are both occurring, then the retardation factor will have to be corrected to remove the biodegradation component.

2.17 Institutional Controls

It is the Department's preference that the RECAP objectives of protection of human health [target risk range of 10^{-6} to 10^{-4} (or less) and/or hazard index less than or equal 1.0], prevention of cross-media transfer, and the protection of resource aesthetics be met without the use of institutional controls. However, under site-specific conditions or when it is **not** technically or economically feasible (as determined by a corrective study) to attain these objectives, institutional controls may be used to supplement treatment and/or containment-based remedial action provided that Department approval is obtained. For an AOI with residual constituent concentrations that: (1) exceed the cumulative cancer risk level of 10^{-4}; (2) exceed a total hazard index of 1.0; (3) result in the exceedance of a limiting RS based on cross-media transfer; and/or (4) exceed a limiting RS based on the protection of resource aesthetics, institutional controls and/or financial assurance shall be required (as deemed appropriate by the Department). Institutional controls shall not be used in such a manner that a property or portion of a property is rendered unsuitable for commerce.

Institutional controls may be used by the Submitter to supplement treatment and/or containment-based remedial action provided that Department approval is obtained. Institutional Controls may not be used as stand-alone remedial measures to address the contamination present at the site. The post-closure care associated with institutional controls will require the Submitter to notify the Department of any situation which may result if the institutional control becomes non-effective and corrective actions have to be taken.

Conveyance Notification. Institutional controls will usually require a legal instrument to be recorded in the parish conveyance records for the subject property. This legal instrument shall clearly state the notice or restriction imposed on the site; the description of the site; and a scaled site map showing the affected soil and groundwater zones. A conveyance notification shall be required under the following site conditions:

(1) A conveyance notification shall be placed on all properties having residual constituent concentrations in soil that are greater than the acceptable exposure concentration defined for non-industrial (residential) land use [i.e., constituent concentrations greater than the $Soil_{ni}$ (or $Soil_{esni}$ if applicable)]. Note: If land use at the AOI is industrial and the limiting soil RS applied at the AOI is a non-risk-based RS ($Soil_{GW}$, $Soil_{sat}$, quantitation limit, or background level) that is lower than the $Soil_{ni}$ (or $Soil_{esni}$) (if applicable), then a conveyance notification shall not be required.

(2) A Groundwater 2 Zone shall be required to have a conveyance notification on that portion of the plume within property boundaries that contains a residual constituent concentration that exceeds the GW_2 RS (without the application of a dilution and attenuation factor).

However, other legal controls may be implemented at the site such as a zoning ordinance by a local government which prevents the installation of groundwater wells and use of existing wells for potable or other purposes. If such a local ordinance is developed, the following must be submitted to the Department: (1) a copy of the ordinance restricting the stated actions at the site; and (2) a scaled map showing the horizontal and vertical extent of contamination of soils or groundwater and the legal boundaries of all properties on which soils or groundwater exceed the RECAP standard. If for any reason the ordinance that is being used as an institutional control changes, the Department reserves the right to evaluate the use of the changed ordinance as an institutional control. Changes or variances to the ordinance must be submitted by the owner/operator/responsible person of the affected site to the Department at least 30 days prior to the scheduled action date.

2.18 Self-Implementation of the RECAP

In some instances, the Submitter may wish to expeditiously remediate an impacted area that is discovered during routine operations or construction activities or that may be due to spill events. This type of activity is implemented by the Submitter without prior LDEQ approval in an effort to prevent migration of COC and/or impact to receptors. Although these actions are often termed interim measures, they are sometimes of sufficient scope and magnitude such that additional corrective action is not warranted. **Self-implementation of the RECAP shall be allowed for these types of activities provided that the following conditions are adhered to:**

(1) All reporting requirements to the Department shall be met;

(2) The Department shall be notified prior to samples being collected:

(a) Within five working days for planned sample events (e.g., a scheduled remediation event); or within two working days when non-time critical (non-emergency) events impact a remediation (e.g., severe rainfall event, unexpected changes to a planned remediation); or as soon as possible but prior to completion of remediation for time critical/unexpected events (e.g., real time spill remediation); and

(b) The sampling notification may be made in person, by telephone or, preferably, in writing to the appropriate LDEQ personnel. The sampling notification requirement has been satisfied if the appropriate LDEQ representative is present on-site during the sampling event and provided an opportunity to collect split samples or if a written waiver of the sampling notification requirement has been provided to the Submitter by the LDEQ prior to the sampling event. Written documentation of all personal and telephone sampling notifications required by this section shall be made to the Department within five (5) working days after the sampling notification. In the event that the five-day written sampling notification was not made, the Submitter shall provide, in the written documentation, a justification as to why such sampling notification was not made;

(3) Reimbursement shall not be sought from the state for remedial action costs that were not part of an emergency response action; and

(4) Engineering or institutional controls shall not be used as part of the final remedy unless installed during an emergency response.

For more extensive site characterization and/or remediation activities, the LDEQ recommends that the LDEQ and the Submitter reach an agreement about site management objectives and site characterization strategy prior to the Submitter expending extensive effort and resources on site activities. Performance of such activities without prior Department approval shall be conducted at the risk of the Submitter.

Investigation Self-Implementation. Preliminary evaluation investigations are conducted for the purpose of determining if a release of COC to the environment has occurred, i.e., screening of the site under the SO (refer to Section 3.0). Typically, these investigations (e.g. Phase II property transfer investigations) are of limited scope and are not sufficient to obtain a NFA-ATT decision from the Department if COC are detected. Site investigations may be self-implemented as preliminary evaluation tools to determine if a release has occurred provided that all laws, regulations, and permit conditions are followed. **Note: If COC are detected at an AOC, applicable LDEQ notification requirements shall be met.**

Self-implemented site investigations that are performed in accordance with Appendix B of this regulation may be considered as part of a more detailed RECAP submittal that includes additional investigation data provided that a sufficient number of samples have been collected and the areas most likely to have been impacted are sampled.

A workplan for a more detailed site investigation should be approved by the Department prior to being implemented. Self-implemented site investigations are performed at the risk of the Submitter. LDEQ may require confirmation sampling for any self-implemented site investigations where no further action is requested.

LDEQ may waive the requirement to submit a Site Investigation Workplan provided that all requirements of Appendix B are followed. The Submitter shall contact the LDEQ to establish the necessity of a Workplan. The requirement for a site investigation Workplan for a MO-1 or MO-2 evaluation shall be made by the Department based on site-specific conditions. A site investigation Workplan shall be submitted for Department approval for all MO-3 evaluations.

The Department may waive the requirement to submit a Site Investigation Workplan at sites determined to be eligible to participate in the Louisiana Motor Fuels Underground Storage Tank Trust Fund. The request for a waiver shall be submitted **prior** to the initiation of field activities and shall include a statement declaring that the investigation will be conducted in accordance with Appendix B. The request for a waiver shall also include a cost estimate to complete the proposed site investigation. The cost estimate shall include all costs related to the completion of the investigation and shall address unit costs should it become necessary to expand the proposed scope of the investigation (horizontally or vertically). Additionally, in order to ensure maximum potential eligibility under the Trust Fund, all site activities shall be conducted in accordance with the latest version of the Louisiana Motor Fuels *Underground Storage Tank Trust Fund Cost Control Guidance Document* and overseen or performed by a Response Action Contractor. Failure to follow these guidelines could result in some or all costs being ruled ineligible for Trust Fund reimbursements.

2.19 Demonstration of Compliance with RECAP Standards

Guidelines for identifying the AOI for remediation are presented below for each Option.

(1) ***Screening Option.*** If corrective action is conducted under the SO, the limiting SS shall serve as the corrective action standard for the identification of the boundaries of the AOI.

(2) ***Management Option 1.*** If corrective action is conducted under MO-1, the limiting MO-1 RS shall serve as the corrective action standard for the identification of the boundaries of the AOI.

(3) ***Management Option 2.*** If corrective action is conducted under MO-2, the limiting MO-2 RS shall serve as the corrective action standard for the identification of the boundaries of the AOI.

(4) ***Management Option 3.*** If corrective action is conducted under MO-3, the limiting MO-3 RS shall serve as the corrective action standard for the identification of the boundaries of the AOI.

Post-corrective action sampling shall be conducted for all media requiring corrective action. The number of data points to be collected shall be determined utilizing the methods presented in *SW846 Test Methods for Evaluating Solid Waste* (EPA) or other methods deemed appropriate by the Department for site-specific conditions. The QA/QC associated with the confirmatory data shall meet the requirements set forth in Sections 2.4 and 2.5.

To demonstrate compliance with the corrective action standards, the residual COC concentration remaining in the environmental medium of concern (soil, sediment, and surface water) following corrective action shall be represented by the lower of the 95%UCL-AM constituent concentration and the maximum detected concentration remaining within the boundaries of the AOI. If appropriate based on site-specific conditions, the use of a volume-weighted average may be approved by the Department for the purpose of demonstrating compliance with the corrective action standard. All confirmatory data points obtained within the boundaries of the AOI shall be used in the calculation of the residual concentration unless skewed due to sample bias. In the calculation of the 95%UCL-AM constituent concentration, all positively detected results (including estimated values flagged with a J qualifier) as well as non-detected results within the boundaries of the AOI shall be considered. Refer to Section 2.8.1 for further guidance on calculating the 95%UCL-AM constituent concentration. Compliance shall be demonstrated when: 1) the residual constituent concentration(s) (the lower of the 95%UCL-AM concentration and the maximum concentration) is less than or equal to the corrective action standard; or 2) the COC concentration detected at each confirmatory sampling location is less than or equal to the corrective action standard. For groundwater, compliance shall be demonstrated when the COC concentration detected at the POC(s) is less than or equal to the corrective action standard for a monitoring frequency and period to be determined by the Department based on site-specific conditions. If the groundwater corrective action standard is exceeded during the post-closure period, further corrective action may be required. For impacted biota, compliance shall be demonstrated when the lower of the 95%UCL-AM concentration and the maximum detected (or modeled) concentration for the edible portion of the samples collected is less than or equal to limiting RS (or predicted to be less than or equal to the limiting RS based on bioaccumulation modeling). The corrective action standard used to demonstrate compliance shall be the limiting RS identified for the medium of concern for the highest RECAP Option completed at the AOI. If it is adequately demonstrated that the residual constituent concentrations at the AOI or in the medium of concern are less than or equal to the corrective action standard, then no further corrective action shall typically be required. Post-corrective action monitoring requirements shall be determined by the Department on a site-specific basis.

2.20 Identification of Landowners, Lessees, and Servitude Holders

The Submitter shall identify the name and mailing address (to the extent reasonably known and available) of all other landowners, lessees, and servitude holders whose property is within an AOI (reasonably known, for the purpose of this section, means the property interest holder of record as identified on the official parish tax assessor's records). This requirement shall not apply to landowners, lessees, and servitude holders that are owned or controlled by, or under common control of, the Submitter, such as parent and subsidiary corporations and partnerships. Where more than one responsible party exists, this duty is satisfied if any one of the responsible parties submits the information. This submission is due with any report required under RECAP that identifies one or more AOI. It must be updated in any subsequent report required under RECAP if there is any material change in information. A material change includes identification of a new AOI or a change in the boundaries of the AOI which affects a new landowner, new lessee, or new servitude holder not previously identified. A map depicting the AOI and identifying the property owners, lessees, and servitude holders within the AOI shall also be submitted.

This section applies only to RECAP submittals made after October 20, 2003.

3.0 SCREENING OPTION

For soil and groundwater meeting the criteria presented in Section 3.1, the Screening Option (SO) may be used to: (1) demonstrate that the COC concentration present in soil and/or groundwater does not pose a threat to human health or the environment and hence does not require further action at this time; (2) identify the AOI and the COC for corrective action of soil and/or groundwater under the SO; or (3) identify the AOI and the COC (in accordance with Section 2.6) for soil and groundwater for further evaluation under a MO. Department-derived Screening Standards (SS) for soil and groundwater are presented in **Table 1**. These SS were developed using protective assumptions with regard to the protection of human health and the prevention of cross-media transfer. The SS comply with Applicable or Relevant and Appropriate Requirements (ARAR) and consider the protection of resource aesthetics. Refer to Section 2.12 for a description of the SS and to Appendix H and Figures 10 – 12 for the methods and assumptions used in the development of the SS. If a constituent detected in soil or groundwater is not listed in Table 1 and the AOC meets the criteria listed in Section 3.1, a SS shall be calculated using the guidelines in Appendix H.

General data requirements for the Screening Option:

(1) Identification of impacted media;
(2) Identification of the constituents present;
(3) Identification of the maximum constituent concentration within the most heavily impacted area of the AOC/AOI (refer to Appendix B for site investigation requirements and Section 2.4 for data quality requirements);
(4) Identification of the SQL for non-detect results;
(5) SPLP data (optional);
(6) Horizontal and vertical boundaries of the AOI (unless otherwise approved by the Department);
(7) Area (acres) of impacted soil;
(8) Exposure pathways associated with current and future land use; and
(9) Environmental fate and transport pathways for constituent migration.

3.1 Criteria for the Management of Soil and Groundwater Under the Screening Option

In order to develop the Department-derived soil and groundwater SS, assumptions were made with regard to: (1) exposure potential at the AOC (receptors, exposure pathways, exposure frequency and duration, intake rates, cumulative exposures); and (2) site characteristics that influence constituent fate and transport (site size, soil characteristics, hydrogeological conditions, etc.). The application of risk-based and cross-media transfer standards is protective only if the AOI shares the same (or reasonably similar) characteristics as those assumed in the development of the standards. Therefore, the soil and groundwater SS presented in Table 1 (or calculated using the guidelines in Appendix H) are only applicable at an AOC or AOI that meets the management criteria listed below.

Application of the SO SS at an AOC that does meet all of the criteria presented below is subject to Department approval prior to submission of the SO assessment.

3.1.1 General Criteria

(1) A non-industrial or industrial exposure scenario is applicable at the AOC and there are no sensitive subpopulations on or near the site. [The SS only consider non-industrial (residential) and industrial exposure scenarios.]

(2) There are no other likely human exposure pathways at or adjacent to the AOC other than the ingestion of soil, the ingestion of groundwater, the inhalation of volatile emissions from soil, the inhalation of volatile emissions from groundwater during household water use, and dermal contact with soil. [The SS do not address the following pathways: inhalation of soil particulates, the inhalation of volatile emissions from soil to an enclosed structure, the inhalation of volatile emissions from groundwater to an enclosed structure, the ingestion of surface water, the inhalation of volatiles from surface water, dermal contact with surface water, the ingestion of sediment, dermal contact with sediment, the inhalation of volatiles from sediment, or the ingestion of biota (recreational or subsistence fishing and/or fish/shellfish propagation or production; meat or dairy production; agricultural crop production). If one or more of these pathways are of concern at an AOC, they shall be addressed under a MO].

3.1.2 Criteria for Impacted Soil

(1) The area of impacted soil under investigation is approximately 0.5 acre or less [The Q/C parameter for the calculation of the volatilization factor (VF) for $Soil_{SSi}$ and $Soil_{SSni}$ values presented in Table 1 are based upon an area of impacted soil that is 0.5 acre in size.];

Exceptions to this criterion:

(a) Soil impacted with inorganic constituents may be screened using the $Soil_{SSi}$ and $Soil_{SSni}$ regardless of the size of the area of impacted soil since the VF is not used in the development of the SS for inorganic constituents.
(b) If the area of impacted soil is greater than 0.5 acre **and** all other criteria for management under the SO are met, a site-specific $Soil_{SSi}$ or $Soil_{SSni}$ may be calculated using the site-specific area of impacted soil and the guidelines in Appendix H. The only site-specific input that may be incorporated into the development of the site-specific $Soil_{SSi}$ or $Soil_{SSni}$ is the Q/C value used in the calculation of a site-specific VF.
(c) If the area of impacted soil is not known, site-specific SS based on estimated areas of impacted soil shall be calculated and applied at the AOC in a re-iterative manner until the boundaries of the AOI have been defined.
(d) An area of soil that is greater than 0.5 acre may be screened under the SO if the limiting SS is based on a quantitation limit, the soil saturation concentration, the

ceiling concentration of 10,000 ppm for TPH, or an approved background concentration.

(2) The impacted soil under investigation is in declining conditions, i.e., the constituent mass is not increasing, the source of the release has been mitigated, and the area of constituent concentrations above the SS is not expanding. [The environmental fate and transport models used to develop the cross-media transfer SS assume steady-state concentrations over the AOC.]

(3) NAPL is not present (i.e., If NAPL was present at the site but has been, or will be, removed to the extent practicable, the adsorbed concentrations in soil may be addressed in the SO evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer SS assume that NAPL is not present.];

Exception to this criterion: The SO may be applied at a soil AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the SS).

(4) Soil impacted with volatile constituents is not present beneath an enclosed structure (the release of volatile emissions from soil to indoor air within an enclosed structure shall be addressed under MO-1, MO-2, or MO-3); and

(5) High fugitive dust emissions are not present [Examples of conditions that contribute to potentially high fugitive dust emissions include dry soil (moisture content less than 8 percent), finely divided or dusty soils (high silt or clay content), high average annual wind speeds (greater than 5.3 m/s), and less than 50 percent vegetative cover. Examples of activities that may generate high dust levels include heavy truck traffic on unpaved roads or other construction related activities. High fugitive dust emissions shall be addressed under MO-2 or MO-3.].

3.1.3 Criteria for Impacted Groundwater

(1) A COC is not discharging via groundwater to a surface water body. [The SS do not address exposure pathways associated with surface water, sediment, or biota. If a COC is discharging via groundwater to a surface water body, then the groundwater shall be addressed under MO-3];

(2) The impacted groundwater under investigation is in declining conditions, i.e., the constituent mass is not increasing, the source of the release has been mitigated, and the area of constituent concentrations above the SS is not expanding. [The environmental fate and transport models used to develop the cross-media transfer SS assume steady-state concentrations over the AOI.];

(3) NAPL is not present (i.e., If NAPL was present at the site but has been, or will be, removed to the extent practicable, the dissolved concentrations in groundwater may be addressed in the SO evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer SS assume that NAPL is not present.];

    Exception to this criterion: The SO may be applied at a groundwater AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) (or current remedial measures) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the SS).

(4) Groundwater impacted with volatile constituents is not present (or anticipated to be present) beneath an enclosed structure (the release of volatile emissions from groundwater to indoor air within an enclosed structure shall be addressed under MO-1, MO-2, or MO-3); and

(5) Volatile emissions from groundwater to the ambient air do not represent a significant source of exposure via the inhalation pathway (the release of volatile emissions from groundwater to the ambient air shall be addressed under MO-1, MO-2, or MO-3).

For soil and groundwater screened under the SO, the Submitter shall demonstrate to the Department that the requirements of Section of 3.1 have been met if Department-derived SS are applied at the AOC.

3.2 The Screening Process: Identification and Application of the Soil and Groundwater Screening Standards

Refer to Appendix H for detailed guidance on identifying and applying the SO soil and groundwater SS.

The limiting SS may be used to: (1) document that an AOC does not pose a threat to human health or the environment and, hence, does not require further action at this time; (2) identify the AOI and the COC for management of the AOC under the SO; or (3) identify the AOI and the COC for further evaluation under MO-1, MO-2, or MO-3 in accordance with Section 2.6. To determine if the soil and/or groundwater at an AOC warrants further evaluation under RECAP (i.e., to screen soil and/or groundwater at an AOC), the SS presented in Table 1 (or calculated in accordance with the applicable guidelines) shall be compared to the maximum constituent concentration detected in each impacted medium. The maximum constituent concentration used in the screening process shall be representative of the most heavily impacted area(s) known or suspected to be present within the AOC. Identification of the most heavily impacted area(s) is subject to concurrence by the Department. If the maximum concentration of a COC exceeds the limiting SS for a medium, then the COC shall be managed under the SO or assessed further under a Management Option. If the maximum concentration of a COC is less than the limiting SS, then the COC is dropped from consideration for that medium (i.e., the COC is screened out under the SO). If the maximum concentration of a COC does not exceed the limiting SS for any medium, then the COC is eliminated from further evaluation. If the maximum concentrations of all COC in a specific medium are less than or equal to their respective limiting SS for that medium, then the medium is dropped from further evaluation (i.e., the medium is screened out under the SO). If the maximum concentrations of all COC in all media are less than or equal to their respective limiting SS, then the AOC typically does not require further evaluation and the SO shall serve to expeditiously document that the AOC does not pose a risk to human health or the environment.

Prior to applying a soil or groundwater SS at an AOC, it is important to recognize that:

(1) The Department-derived SS (Table 1) are not available for all possible chemical forms of a constituent. In some site-specific situations, a constituent may exist in a particular chemical form such that the toxicity and/or fate and transport of the constituent is significantly different from that assumed for the development of the SS, thus making the application of the SS inappropriate under site-specific conditions. For example, the development of a soil SS for barium is based on the assumption that barium is present at the site in a mobile, ionic form. If barium is present at a site in a less mobile, inert, form such as barium sulfate, the SS would not be appropriate for screening the site. Another example is organic mercury. In general, the organic forms of mercury are more toxic than the inorganic forms and have not been addressed under the SO. If an EPA toxicity value is available for a specific chemical form of a constituent, then a SS may be developed by the Submitter. Refer to Section 2.15 for guidance on identifying the toxicity values.

(2) The soil and groundwater (Table 1) SS are based on the protection of human health and environmental resources, they do not address ecological risks. A screening level ecological risk assessment shall be required if the ecological checklist (Appendix C, RECAP Form18) indicates that ecological risks may be of concern. Areas of a facility, media, and constituents eliminated from consideration during the SO shall be included in the evaluation of ecological risks.

3.3 Screening Standards for Other Exposure Pathways and Media

Screening Standards are not available for all soil and groundwater exposure pathways or all environmental media. For exposure pathways not addressed by the soil and groundwater SS (e.g., volatile emissions from soil and groundwater to an enclosed structure, soil particulate emissions to the ambient air, and volatile emissions from shallow groundwater to the ambient air) and other environmental media (e.g., surface water, sediment and biota), the Department-approved analytical quantitation limit or background concentration for the medium of concern shall serve as the SS.

3.4 Screening Option Submittal Requirements

A SO Submittal Report shall be submitted to the Department for approval. This report shall, at a minimum, meet the submittal requirements listed below. Any variance from these requirements is subject to Department approval prior to submission of the SO report. Refer to Appendix C for the RECAP Forms.

(1) RECAP Form 1 Submittal Summary;
(2) RECAP Form 2 Analytical Data Summary;
(3) RECAP Form 3 Analytical Data Evaluation;
(4) RECAP Form 4 Sampling Information Summary;
(5) RECAP Form 5 Groundwater Monitoring Well Characteristics (if applicable);
(6) RECAP Form 6 Groundwater Monitoring Well Sampling Event Summary (if applicable);
(7) RECAP Form 10 Screening Option Summary for Soil (if applicable);
(8) RECAP Form 15 Screening Option Summary for Groundwater (if applicable);
(9) RECAP Form 18 Ecological Checklist;
(10) Site ranking and justification for the ranking;
(11) Site history and site setting;
(12) Topographic map with the AOC or the AOI labeled and name of quadrangle*;
(13) Vicinity map with adjoining properties, cross streets and land use*;
(14) Site map with all significant features;
(15) Detailed AOC or AOI map with identification of all sampling locations and the boundaries of the AOI*;
(16) Identification of current and future land use at and in the vicinity of the AOC;
(17) Documentation that the soil and/or groundwater meets the criteria for screening under the SO;
(18) Site investigation data with supporting QA/QC (see Section 2.4);
(19) Conceptual Site Model;
(20) For constituents not listed in Table 1, the calculations used in the development of the SS and RECAP Form 8 chemical-specific data summary;
(21) Identification of the groundwater POC;
(22) Identification of the AOI and COC requiring remediation under the SO or further assessment under a MO;
(23) Identification of areas/media where action has been taken (if applicable); and
(24) If applicable, landowners, lessees, and servitude holders (refer to Section 2.20).

*Note: All maps must have a bar scale, legend, north arrow, contour intervals (if contoured), date data was obtained, and map date. All maps, figures, diagrams, and cross sections submitted must be legible and, unless otherwise approved by the Department, not larger than 11 inches by 17 inches and must be folded to a standard report format (8.5 inches by 11 inches).

4.0 MANAGEMENT OPTION 1

Management Option 1 (MO-1) provides Department-derived RECAP Standards (RS) for the evaluation of soil and groundwater meeting the criteria presented in Section 4.1. The MO-1 RS represent constituent concentrations in soil and groundwater that are protective of human health and the environment. The comparison of the MO-1 RS with the soil AOIC and/or groundwater CC serves to provide predictable, consistent guidance regarding when further evaluation and/or corrective action is warranted at a site. The MO-1 RS were developed for non-industrial and industrial exposure scenarios using protective assumptions with regard to the protection of human health and the prevention of cross-media transfer. The MO-1 RS comply with ARAR and consider the protection of resource aesthetics. The MO-1 RS for soil and groundwater are presented in Tables 2 and 3 for constituents frequently encountered at AOC. If a constituent is not listed in these tables, then the Submitter shall calculate a MO-1 RS using the guidelines in Appendix H. Refer to Section 2.12 for a description of the MO-1 RS. Refer to Appendix H and Figures 10, 12, 13, 14, and 15 for the methods and assumptions used in the development of the soil and groundwater MO-1 RS.

In general, MO-1 functions as a tier 1 evaluation to determine if impacted soil and groundwater pose a risk to human health and/or the environment. The MO-1 limiting RS is compared to the soil AOIC and/or groundwater CC to determine whether or not further evaluation of the soil or groundwater is warranted. If the soil AOIC and groundwater CC for all COC are less than or equal to the respective MO-1 limiting RS, then typically, NFA-ATT is required for soil and groundwater. If the soil AOIC and/or groundwater CC for a COC exceeds the MO-1 limiting RS, then a more site-specific evaluation of that medium is warranted under MO-2 or MO-3. If the soil AOIC or groundwater CC exceeds the MO-1 limiting RS and the Submitter does not wish to manage the AOI under MO-2 or MO-3, then corrective action shall be implemented and the MO-1 limiting RS shall be used as the corrective action standard. Refer to Section 2.6 for the requirements for identifying the AOI and the COC and Section 2.8 for guidelines for estimating the AOIC and groundwater CC for a MO-1 assessment.

General data requirements for Management Option 1:

(1) Historical information related to the release (if known);
(2) Site investigation data and supporting QA/QC data;
(3) Geology, hydrology, and hydrogeology of the AOI;
(4) Identification of COC and media impacted;
(5) Maximum or 95%UCL-AM constituent concentration in soil;
(6) SQL for non-detect results;
(7) Horizontal and vertical boundaries of the AOI;
(8) Groundwater classification of the zone of concern based on aquifer yield or TDS; location, depth, and use of groundwater wells within a 1-mile radius; thickness of the groundwater plume (S_d); CC at the POC; POE; distance to the nearest downgradient property boundary (if applicable); designated use of, and distance to, the nearest downgradient surface water body (if applicable);

(9) Area (acres) of impacted soil;
(10) Distribution of the constituent concentrations present within the AOI (refer to Appendix B for site investigation requirements and Section 2.4 for data quality requirements);
(11) SPLP data (optional);
(12) Critical effects/target organs for each COC that elicits noncarcinogenic health effects;
(13) Receptors and exposure pathways associated with current and future land use; and
(14) Environmental fate and transport pathways for constituent migration.

4.1 Criteria for the Management of Soil and Groundwater Under Management Option 1

In order to develop MO-1 soil and groundwater RS, assumptions were made with regard to: (1) exposure potential at the AOC or the AOI (receptors, exposure pathways, exposure frequency and duration, intake rates, and cumulative exposures); and (2) site characteristics that influence constituent fate and transport (site size, soil characteristics, hydrogeological conditions, etc.). The application of risk-based and cross-media transfer standards are protective only if the AOI shares the same (or reasonably similar) characteristics as those assumed in the development of the standards. Therefore, the soil and groundwater RS are only applicable at an AOI that meets the management criteria listed below. Application of the MO-1 RS at an AOC or an AOI that does not meet all of the criteria for management under MO-1 shall receive Department approval prior to submission of the MO-1 assessment.

4.1.1 General Criteria

(1) A non-industrial or industrial exposure scenario is applicable at the AOC or the AOI and there are no sensitive subpopulations on or near the AOI. [The MO-1 RS only consider residential and industrial exposure scenarios.]; and

(2) There are no other likely human exposure pathways at or adjacent to the AOC or the AOI other than the ingestion of soil, the ingestion of groundwater, the inhalation of volatile emissions from soil to the ambient air, the inhalation of volatile emissions from groundwater to the ambient air, the inhalation of volatile emissions from groundwater to indoor air during household water use, the inhalation of volatile emissions from soil to an enclosed structure, the inhalation of volatile emissions from groundwater to an enclosed structure, and dermal contact with soil. [The MO-1 RS do not address the following pathways: inhalation of particulates, the ingestion of surface water, the inhalation of volatiles from surface water, dermal contact with surface water, the ingestion of sediment, dermal contact with sediment, the inhalation of volatiles from sediment, or the ingestion of biota (recreational or subsistence fishing and/or fish/shellfish propagation or production; meat or dairy production; agricultural crop production). If any of these pathways are of concern at an AOC, they shall be addressed under MO-2 or MO-3].

4.1.2 Criteria for Impacted Soil

(1) The area of impacted soil is approximately 0.5 acre or less. [The Q/C parameter for the calculation of the volatilization factor for $Soil_i$ and $Soil_{ni}$ and the S_w parameter for the calculation of the dilution factors (DF) for $Soil_{GW2}$ and $Soil_{GW3}$ are based on an area of impacted soil that is 0.5 acre in size.];

Exceptions to this criterion: The MO-1 $Soil_{es}$ may be applied regardless of the size of the area of impacted soil because the $Soil_{es}$ RS is not dependent on this parameter. The MO-1 $Soil_i$ and $Soil_{ni}$ may be applied to an area of impacted soil greater than 0.5 acre if:

(a) The COC is an inorganic constituent (the VF is not used in the development of RS for inorganic constituents);
(b) The limiting MO-1 RS is based on a quantitation limit, the soil saturation concentration ($Soil_{sat}$), $Soil_{es}$, the ceiling concentration of 10,000 ppm for TPH, or an approved background concentration (the VF and DF are not applicable); and
(c) The limiting MO-1 RS is based on the $Soil_{GW1}$ (a DF is not applicable).

(2) The impacted soil is in declining conditions, i.e., the constituent mass is not increasing; the source of the release has been mitigated. [The environmental fate and transport models used to develop the cross-media transfer RS assume steady-state concentrations over the AOI.];

(3) NAPL is not present (i.e., If NAPL was present at the site but has been, or will be, removed to the extent practicable, the adsorbed concentrations in soil may be addressed in the MO-1 evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer RS assume that NAPL is not present.];

Exception to this criterion: MO-1 may be applied at a soil AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-1 limiting RS); and

(4) High fugitive dust emissions are not present [Examples of conditions that contribute to potentially high fugitive dust emissions include dry soil (moisture content less than 8 percent), finely divided or dusty soils (high silt or clay content), high average annual wind speeds (greater than 5.3 m/s), and less than 50 percent vegetative cover. Examples of activities that may generate high dust levels include heavy truck traffic on unpaved roads or other construction related activities. High fugitive dust emissions shall be addressed under MO-2 or MO-3.].

4.1.3 Criteria for Impacted Groundwater

(1) A COC(s) is not discharging via groundwater to a surface water body. [The MO-1 RS do not address exposure via surface water, sediment, or biota.];

(2) The area of impacted soil that is responsible for the impact to the groundwater zone is approximately 0.5 acre or less. [The MO-1 DF2 (GW_2 zone), DF3 (GW_3 zone), and GW_{air} (GW_1, GW_2, and GW_3 zones) are based on an area of impacted soil that is 0.5 acre in size (S_w parameter and W parameter, respectively).]

    Exception to this criterion: The MO-1 GW_1 (GW_1 zone) and GW_{es} (GW_1, GW_2, and GW_3 zones) may be applied to a groundwater zone regardless of the size of the area of impacted soil because the GW_{es} RS is not dependent on this parameter and a DF is not applied to the GW_1 RS;

(3) The impacted groundwater is in declining conditions, i.e., the constituent mass is not increasing; the source of the release has been mitigated. [The environmental fate and transport models used to develop the cross-media transfer RS assume steady-state concentrations over the AOI.]; and

(4) NAPL is not present (i.e., If NAPL was present at the site but has been, or will be, removed to the extent practicable, the dissolved concentrations in groundwater may be addressed in the MO-1 evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer RS assume that NAPL is not present.].

    Exception to this criterion: MO-1 may be applied at a groundwater AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) (or current remedial measures) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-1 limiting RS).

The Submitter shall demonstrate to the Department that the AOC or the AOI for soil and groundwater meets the above criteria to qualify for management under MO-1 and that a site evaluation has been conducted in accordance with the guidelines in Appendix B. If the AOC or the AOI for soil and groundwater does not meet **all** of these criteria, then LDEQ considers the AOC or the AOI to be sufficiently complex to warrant a more detailed assessment of risk and the AOC or the AOI shall be addressed under MO-2 or MO-3 depending on site-specific exposure conditions.

Different AOC or AOI within a facility may be managed under different Management Options if the areas meet the criteria for management under the Options selected by the Submitter.

Exposure pathways and media not addressed by the soil and groundwater MO-1 RS shall be addressed under MO-2 or MO-3.

An ecological checklist shall be completed (refer to Appendix C, RECAP Form 18). If the ecological checklist indicates that an ecological assessment is warranted, then an ecological risk assessment shall be required in addition to the MO-1 human health assessment.

4.2 Identification and Application of the Management Option 1 Soil and Groundwater RECAP Standards

Refer to Appendix H for detailed guidance on the identification and application of the MO-1 limiting RECAP Standards at the AOI.

The MO-1 limiting RS (obtained from Tables 2 and 3) may be applied as an action standard or a corrective action standard (refer to Sections 4.2.1 and 4.2.2).

Prior to applying a MO-1 limiting RS at an AOI, it is important to recognize that:

(1) The RS developed under MO-1 are not available for all possible chemical forms of a constituent. In some site-specific situations, a COC may exist in a particular chemical form such that the toxicity and/or fate and transport of the constituent is significantly different from that assumed for the development of the MO-1 RS thus, making the application of the MO-1 RS inappropriate for site-specific conditions. For example, the development of a soil RS for barium is based on the assumption that barium is present at the AOI in a mobile, ionic form. If barium is present at an AOI in a less mobile, inert, form such as barium sulfate, the MO-1 RS would not be appropriate for making decisions concerning the management of the AOI. Another example is organic mercury. In general, the organic forms of mercury are more toxic than the inorganic forms and have not been addressed under MO-1. If an EPA toxicity value is available for a specific chemical form of a constituent, then a MO-1 RS may be developed by the Submitter in accordance with Appendix H.

(2) The MO-1 RS are based on the protection of human health and environmental resources; they do not address ecological risks. Further site evaluation may be required if the ecological checklist (refer to Appendix C, RECAP Form 18) indicates the AOI may pose a risk to ecological receptors.

4.2.1 Use of MO-1 Soil and Groundwater RECAP Standards to Screen an AOI or to Support a NFA-ATT Decision

The MO-1 limiting RS (as identified in accordance with the guidelines in Appendix H) may be used as an action standard to: (1) screen an AOI for further evaluation (i.e., identify areas, media, constituents, and/or pathways which warrant further evaluation under MO-2 or MO-3); or (2) support a NFA-ATT (i.e., document that the soil AOIC and/or groundwater CC are less than or equal to a constituent concentration that is protective of human health and the environment. To screen an AOI or to demonstrate compliance under MO-1, the MO-1 limiting RS shall be compared to the soil AOIC and groundwater CC as defined in Section 2.8. If the soil AOIC and groundwater CC for all COC present in soil and groundwater at the AOI are less than or equal to the MO-1 limiting RS, then typically no further evaluation shall be required for soil and groundwater. Requests to the Department for a NFA-ATT determination under MO-1 shall demonstrate that: (1) the AOI meets the criteria for management under MO-1; (2) current site conditions meet the limiting RS set forth under MO-1 without the use of decontamination or control measures; (3) the MO-1 RS have been modified to account for additive effects due to exposure to multiple constituents which elicit noncarcinogenic effects on the same target organ/system **and/or** exposure to more than one impacted medium by the same receptor; and (4) the SQL for non-detected constituents are less than the limiting RS.

If the soil AOIC or groundwater CC for a COC is less than or equal to the MO-1 limiting RS, then the COC does not require further assessment at this time for that medium (i.e., the constituent is screened out under MO-1). If the soil AOIC is less than the MO-1 limiting RS for all COC, then the soil does not require further assessment at this time (i.e., the soil is screened out under MO-1). If the groundwater CC is less than the MO-1 RS for all COC, then the groundwater does not require further assessment at this time (i.e., the groundwater is screened out under MO-1).

If a soil AOIC or groundwater CC exceeds a MO-1 limiting RS, the Submitter shall: (1) conduct a more site-specific evaluation under MO-2 or MO-3; or (2) use the MO-1 RS to define the extent of corrective action required at the AOI for the protection of human health and the environment.

4.2.2 Use of MO-1 Soil and Groundwater RECAP Standards as Corrective Action Standards

If the soil AOIC and/or groundwater CC (as defined in Section 2.8) exceeds the MO-1 limiting RS (as identified in accordance with guidelines in Appendix H), and the Submitter does not wish to conduct a site-specific evaluation under MO-2 or MO-3, then the soil and/or groundwater shall be remediated to the MO-1 limiting RS (refer to Section 2.18).

4.3 Management Option 1 Submittal Requirements

A Management Option 1 Submittal Report shall be submitted to the Department for approval. This report shall include, at a minimum, the submittal requirements listed below. Any variance from these requirements is subject to Department approval prior to submission of the MO-1 report. Refer to Appendix C for the RECAP forms.

(1) RECAP Form 1 Submittal Summary;
(2) RECAP Form 2 Analytical Data Summary;
(3) RECAP Form 3 Analytical Data Evaluation;
(4) RECAP Form 4 Sampling Information Summary;

(5) RECAP Form 5 Groundwater Monitoring Well Characteristics (if applicable);
(6) RECAP Form 6 Groundwater Monitoring Well Sampling Event Summary (if applicable);
(7) RECAP Form 11 Management Option 1 Summary for Soil 0-15 ft bgs (if applicable);
(8) RECAP Form 12 Management Option 1 Summary for Soil > 15 ft bgs (if applicable);
(9) RECAP Form 16 Management Option 1 Summary for Groundwater (if applicable);
(10) RECAP Form 18 Ecological Checklist;
(11) Site ranking and justification for the ranking;
(12) Topographic map with the AOC or the AOI labeled and name of quadrangle*;
(13) Vicinity map with adjoining properties, cross streets and land use*;
(14) A site map with all significant features;
(15) Identification of the horizontal and vertical boundaries of the AOI for soil and groundwater and a detailed AOI map with longitude, latitude, and all sampling locations*;
(16) A description of the site including history, setting, size, geology, hydrology, and hydrogeology;
(17) A description of land use at and in the vicinity of the AOC or the AOI;
(18) A description of groundwater use at and in the vicinity (one-mile radius) of the AOC or the AOI including a DOTD well survey obtained within the last 12 months;
(19) The groundwater classifications of the zones under evaluation and information used to arrive at this determination and the location of the POC and POE;
(20) Identification of all known underground utilities (≤ 15 feet bgs) within or adjacent to the AOC or the AOI;
(21) Documentation that the soil and/or groundwater meets the criteria for management under MO-1;
(22) Site investigation data with supporting QA/QC (refer to Section 2.4) and data evaluation/data usability report;
(23) Identification of the COC;
(24) Identification of the AOIC for each COC in soil (including all calculations and identification of the sampling locations used in the calculations);
(25) Conceptual Site Model;
(26) For constituents not listed in Tables 2 and 3, the calculations used in the development of MO-1 RS and RECAP Form 8 Chemical-Specific Data Summary;
(27) Documentation of the methods used to determine the limiting MO-1 RS; identification of the critical effects/target organs for each noncarcinogenic COC and demonstration modifications of the MO-1 RS to account for additive effects (including calculations);
(28) The results of the SO (if conducted);
(29) Identification of areas/media where action has been taken (if applicable);
(30) Identification of the AOI and COC requiring corrective action under MO-1 or further assessment under MO-2 or MO-3; and

(31) If applicable, identification of landowners, lessees, and servitude holders (refer to Section 2.20).

*Note: All maps must have a bar scale, legend, north arrow, contour intervals (if contoured), date data was obtained, and map date. All maps, figures, diagrams and cross sections submitted must be legible and unless otherwise approved by the Department, not larger than 11 inches by 17 inches and must be folded to a standard report format (8.5 inches by 11 inches).

5.0 MANAGEMENT OPTION 2

Management Option 2 (MO-2) provides for the development of soil and groundwater RS using RME assumptions for the protection of human health and site-specific data for the evaluation of constituent fate and transport. The MO-2 RS represent constituent concentrations in media that are protective of human health and the environment under site-specific conditions. The MO-2 RS shall be developed in accordance with the risk assessment methodologies and analytical fate and transport models included in Appendix H. A description of the MO-2 soil and groundwater RECAP Standards is presented in Section 2.12. The methods for developing the soil and groundwater MO-2 RS are illustrated in Figures 10, 12, 13, 14, and 15.

The MO-2 risk-based RS for soil shall address exposure via the ingestion, inhalation, and dermal routes. The MO-2 risk-based RS for groundwater shall address exposure via the ingestion and inhalation routes. MO-2 RS shall only be developed for the receptors, exposure scenarios, exposure pathways, land uses, and environmental media included in Appendix H. Site-specific data shall be used for the evaluation of constituent fate and transport. In the absence of site-specific fate and transport data, protective default assumptions as specified under MO-2 shall be used. MO-2 RS based on site-specific data are only applicable at the AOI for which they were developed. MO-2 RS developed for one AOI shall not be applied at another AOI unless it is adequately documented that the RS are appropriate for the AOI and the Department concurs. The MO-2 RS shall comply with ARAR and shall consider the protection of resource aesthetics.

In general, MO-2 functions as a tier 2 evaluation to determine if site conditions pose a risk to human health or the environment. The Submitter may choose to evaluate the soil or groundwater under the SO and/or MO-1 prior to the MO-2 evaluation, or the Submitter may proceed directly to a MO-2 evaluation. The MO-2 limiting RS shall be compared to the soil AOIC and or groundwater CC to determine if site conditions warrant further evaluation. If the soil AOIC and/or groundwater CC for all COC are less than or equal to the MO-2 limiting RS, then typically no further evaluation of the soil and/or groundwater will be required at this time. If the soil AOIC and/or groundwater CC for a COC exceeds the MO-2 limiting RS for the appropriate use scenario, the Submitter may choose to conduct a more site-specific evaluation under MO-3. If the Submitter does not wish to manage the soil and or groundwater under MO-3, corrective action shall be implemented and the MO-2 limiting RS shall be used as corrective action standard. Refer to Section 2.6 for the requirements for identifying the AOI and the COC and to Section 2.8 for guidelines on estimating the AOIC and the groundwater CC for a MO-2 assessment.

Management Option 2 provides for the evaluation of soil and groundwater. Management Option 2 does not provide for the evaluation of other environmental media. Impacted surface water, sediment, and biota shall be addressed under MO-3.

General data requirements for Management Option 2:

(1) Historical information related to the release (if known);

(2) Site investigation data and supporting QA/QC data;
(3) Geology, hydrology, and hydrogeology of the AOI;
(4) Identification of COC and media impacted;
(5) Distribution of the constituent concentrations present within the AOI (refer to Appendix B for site investigation requirements and Section 2.4 for data quality requirements);
(6) Maximum or 95%UCL-AM constituent concentration in soil;
(7) SQL for non-detect results;
(8) Horizontal and vertical boundaries of the AOI;
(9) Site-specific environmental fate and transport data which may include area (acres) of impacted soil, dry soil bulk density, water-filled soil porosity, soil particle density, and fractional organic carbon in soil (refer to Appendix H for a complete listing of site-specific parameters for the exposure and environmental fate and transport pathways identified at the AOI); Not all of the fate and transport parameters identified in Appendix H as requiring site-specific data need to be determined on a site-specific basis. The Submitter may choose to collect partial site-specific data, however it is strongly recommended that at a minimum, f_{oc} and SPLP data be collected. Note: Site-specific data **requirements for Appendix I** assessments include, at a minimum, fractional organic carbon in soil, depth of the impacted groundwater zone, and dimensions of buildings present at the site;
(10) Groundwater classification of the zone of concern based on aquifer yield or TDS; location, depth, and use of groundwater wells within a 1-mile radius; thickness of the groundwater plume (S_d); CC at the POC; POE; distance to the nearest downgradient property boundary (if applicable); designated use of, and distance to, the nearest downgradient surface water body (if applicable);
(11) Area (acres) of impacted soil;
(12) Distribution of the constituent concentrations present within the AOI (refer to Appendix B for site investigation requirements and Section 2.4 for data quality requirements);
(13) SPLP data (optional);
(14) Critical effects/target organs for each COC that elicits noncarcinogenic health effects;
(15) Receptors and exposure pathways associated with current and future land use; and
(16) Environmental fate and transport pathways for constituent migration.

5.1 Criteria for Management of Soil and Groundwater Under Management Option 2

An AOI must meet the criteria listed below to be managed under MO-2. Application of the MO-2 RS at an AOC or an AOI that does meet all of the criteria for management under MO-2 shall receive Department approval prior to submission of the MO-2 assessment.

5.1.1 General Criteria

(1) A non-industrial or an industrial exposure scenario is applicable at the AOC or the AOI and there are no sensitive subpopulations on or near the AOI. [The MO-2 RS only consider residential and industrial exposure scenarios.]; and

(2) There are no other likely human exposure pathways at or adjacent to the AOC or the AOI other than the ingestion of soil, the ingestion of groundwater, the inhalation of volatile emissions from soil, the inhalation of particulates from soil, the inhalation of volatile emissions from groundwater, and dermal contact with soil. [The MO-2 RS do not address the ingestion of surface water, the inhalation of volatiles from surface water, dermal contact with surface water, the ingestion of sediment, dermal contact with sediment, the inhalation of volatiles from sediment, or the ingestion of biota (recreational or subsistence fishing and/or fish/shellfish propagation or production; meat or dairy production; agricultural crop production). If other pathways are of concern at the AOI, they shall be addressed under MO-3.].

5.1.2 Criteria for Impacted Soil

(1) The impacted soil is in declining conditions, i.e., the constituent mass is not increasing; the source of the release has been mitigated. [The environmental fate and transport models used to develop the cross-media transfer RS assume steady-state concentrations over the AOI.]; and

(2) NAPL is not present (i.e., If NAPL was present at the site but has been, or will be, removed to the extent practicable, the adsorbed concentrations in soil may be addressed in the MO-2 evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer RS assume that NAPL is not present.].

Exception to this criterion: MO-2 may be applied at a soil AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-2 limiting RS).

5.1.3 Criteria for Impacted Groundwater

(1) A COC(s) is not discharging via groundwater to a surface water body. [The MO-2 RS do not address exposure via surface water, sediment, or biota.];

(2) The impacted groundwater is in declining conditions, i.e., the constituent mass is not increasing; the source of the release has been mitigated. [The environmental fate and transport models used to develop the cross-media transfer RS assume steady-state concentrations over the AOI and that NAPL is not present.]; and

(3) NAPL is not present. [Note: If NAPL was present at the site but has been, or will be, removed to the extent practicable, the dissolved concentrations in groundwater may be included in the MO-2 evaluation.].

Exception to this criterion: MO-2 may be applied at a groundwater AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) (or current remedial measures) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-2 limiting RS).

The Submitter shall demonstrate to the Department that the AOC or the AOI meets the above criteria to qualify for management under MO-2 and that a site evaluation has been conducted in accordance with the guidelines in Appendix B. If an AOC or an AOI does not meet all of these criteria, then the LDEQ considers the AOC or the AOI to be sufficiently complex to warrant a more detailed assessment of risk and the AOC or the AOI shall be addressed under MO-3.

An ecological checklist (refer to Appendix C, RECAP Form 18) shall be completed. If the ecological checklist indicates that the AOC or the AOI may pose ecological risk, then an ecological risk assessment shall be required in addition to the MO-2 human health assessment.

Areas of investigation for soil and groundwater that qualify for management under MO-2 that do not qualify for management under MO-1 include:

(1) An area of impacted soil that is greater than 0.5 acre. [Site-specific data pertaining to the size of the AOI may be used for the Q/C parameter for the calculation of the volatilization factor for soil, the W parameter for the calculation of the GW_{air}, and the S_w parameter for the calculation of the dilution and attenuation factor for GW_2, GW_3, $Soil_{GW2}$, and $Soil_{GW3}$]; and

(2) An AOC or an AOI with unusually high fugitive dust emissions such as construction areas, areas with unpaved, heavily traveled roads, etc. [Soil RS which include exposure via the inhalation of soil particulates may be developed under MO-2.].

5.2 Development and Application of the Management Option 2 Soil and Groundwater RECAP Standards

Refer to Appendix H for detailed guidance on the development, identification, and application of the limiting MO-2 RECAP Standard.

The limiting MO-2 RS may be applied as an action standard or a corrective action standard. Guidelines on the application of the MO-2 limiting RS are presented in Sections 5.2.1 and 5.2.2 and Appendix H. Prior to applying a MO-2 soil or groundwater RS, it is important to recognize that MO-2 RS are based on the protection of human health and environmental resources, they do not evaluate ecological risks. Therefore, compliance with MO-2 RS should not be interpreted to mean that **all** site risks are acceptable. Further site evaluation may be required if the ecological checklist indicates that there is potential for ecological risk at the AOI.

5.2.1 Application of MO-2 Soil and Groundwater RECAP Standards to Screen an AOI or to Support a NFA-ATT Decision

The Management Option 2 limiting RS (as identified in accordance with the guidelines in Appendix H) may be used to: (1) screen an AOI (i.e., identify areas, media, constituents, and/or pathways which warrant further evaluation under MO-3); or (2) support a NFA-ATT decision (i.e., document that the soil AOIC and/or groundwater CC are less than or equal to a constituent concentration that is protective of human health and the environment). The site-specific MO-2 RS shall be compared to the soil AOIC and groundwater CC as defined in Section 2.8. If the AOIC and groundwater CC for all COC present in soil and groundwater are less than or equal to the MO-2 limiting RS, then typically no further action is required. Requests to the Department for an NFA-ATT determination under MO-2 shall demonstrate that: (1) the AOI meets the criteria for management under MO-2; (2) current site conditions meet the RS set forth under MO-2 without the use of removal, decontamination, or control measures; (3) the MO-2 RS have been modified to account for additive effects due to exposure to multiple constituents which elicit noncarcinogenic effects on the same target organ/system **and/or** exposure to more than one impacted medium by the same receptor; and (4) the SQL for non-detected constituents are less than the limiting RS.

If the soil AOIC or groundwater CC for a COC is less than or equal to the MO-2 limiting RS, then the COC does not require further assessment at this time for that medium (i.e., the COC is screened out under MO-2). If the soil AOIC or groundwater CC is less than the MO-2 limiting RS for all COC, then that medium does not require further assessment at this time (i.e., the medium is screened out under MO-2).

If the soil AOIC and/or groundwater CC exceeds the MO-2 limiting RS, then corrective action shall be instituted **or** the soil and/or groundwater shall be evaluated further under MO-3.

5.2.2 Application of MO-2 Soil and Groundwater RECAP Standards as Corrective Action Standards

If a soil AOIC or groundwater CC (as defined in Section 2.8) exceeds the MO-2 limiting RS (as identified in accordance with the guidelines in Appendix H), and the Submitter does not wish to conduct a site-specific evaluation under MO-3, then the AOI shall be remediated to the MO-2 limiting RS (refer to Section 2.18).

5.3 Management Option 2 Underground Storage Tank (UST) Soil and Groundwater RECAP Standards

As an example of a MO-2 evaluation, a site-specific evaluation has been performed for typical UST sites. Relative to sites at large facilities (landfills, RCRA facilities, chemical plants, etc.), UST sites are unique because: (1) most sites are similar in size; (2) the COC are relatively limited and identical; (3) the sources of COC are generally limited (i.e. tank hold, pipe chase, and dispenser islands); and (4) the exposure conditions at the site are similar. Due to these factors and the abundance of information that has been obtained from numerous UST sites in Louisiana and across the country, a site-specific MO-2 RECAP example evaluation has been developed by the Department for typical UST sites (refer to Appendix I). The RS presented in the Appendix I example may be applied at typical UST sites which meet the criteria presented in Appendix I. Appendix I incorporates site-specific environmental fate and transport information that will be gathered during site investigation activities at UST sites. Sites are classified according to: (1) source length (L) (see Figure I-3); (2) source width (S_w) (see Figure I-3); and (3) fractional organic carbon present in soil that is unimpacted but representative of the impacted area.

Sites evaluated using Appendix I are required to meet all Appendix I submittal requirements. Although this MO-2 evaluation will be used at many UST sites that meet Appendix I management criteria, a more site-specific MO-2 analysis or a MO-3 analysis may be required by the Department on a site-specific basis dependent on site conditions. Exposure pathways not addressed in Appendix I may be addressed under a site-specific MO-2 conducted in conjunction with the Appendix I evaluation.

5.4 Management Option 2 Submittal Requirements

A Management Option 2 Submittal Report shall be submitted to the Department for approval. This report shall, at a minimum, meet the submittal requirements listed below. Any variance from these requirements is subject to Department approval prior to submission of the MO-2 report. Refer to Appendix C for the RECAP forms.

(1) RECAP Form 1 Submittal Summary;
(2) RECAP Form 2 Analytical Data Summary;
(3) RECAP Form 3 Analytical Data Evaluation;
(4) RECAP Form 4 Sampling Information Summary;
(5) RECAP Form 5 Groundwater Monitoring Well Characteristics (if applicable);
(6) RECAP Form 6 Groundwater Monitoring Well Sampling Event Summary (if applicable);
(7) RECAP Form 7 Site-Specific Environmental Fate and Transport Data Summary;
(8) RECAP Form 8 Chemical-specific Data Summary;
(9) RECAP Form 13 Management Option 2 Summary for Soil 0-15 ft bgs (if applicable);
(10) RECAP Form 14 Management Option 2 Summary for Soil > 15 ft bgs (if applicable);

(11) RECAP Form 17 Management Option 2 Summary for Groundwater (if applicable);
(12) RECAP Form 18 Ecological Checklist;
(13) A summary of the results of the SO evaluation (if conducted) and/or the results of the MO-1 assessment (if conducted);
(14) Site ranking and justification for the ranking;
(15) Topographic map with AOI labeled and name of quadrangle*;
(16) Vicinity map with adjoining properties, cross streets and land use*;
(17) Site map with all significant features;
(18) Identification of the horizontal and vertical boundaries of the AOI for each impacted medium and a detailed AOI map with all sampling locations*;
(19) A description of the site including history, setting, size, geology, hydrology, and hydrogeology;
(20) A description of land use at and in the vicinity of the AOI;
(21) A description of groundwater use at and in the vicinity (one-mile radius) of the AOC or the AOI including a DOTD well survey obtained within the last 12 months;
(22) The groundwater classifications of the zones under evaluation and information used to arrive at this determination, POC, and POE;
(23) Identification of all known underground utilities (≤ 15 feet bgs) within or adjacent to the AOI;
(24) Documentation that the soil and/or groundwater meets the criteria for management under MO-2;
(25) Site investigation data with supporting QA/QC (refer to Section 2.5) and data evaluation/data usability report;
(26) Identification of the COC and the methods used to identify the COC;
(27) Identification of the AOIC for each COC in soil (including all calculations and identification of the sampling locations used in the calculations);
(28) A conceptual site model (refer to Figure 8);
(29) If applicable, an environmental fate and transport analysis including identification of the model(s) used, a discussion on the appropriateness of the model(s) for site conditions, model outputs, and a discussion of uncertainties associated with the fate and transport analysis;
(30) Documentation of the methods and calculations used to determine the limiting MO-2 RS; identification of target organ/system for each noncarcinogenic COC and demonstration of the modifications to the MO-2 RS to account for additive effects (including calculations);
(31) Identification of areas/media where action has been taken (if applicable);
(32) Identification of the AOI and COC for the MO-3 assessment or for remediation under MO-2; and
(33) If applicable, the identification of landowners, lessees, and servitude holders (refer to Section 2.20).

*Note: All maps must have a bar scale, legend, north arrow, contour intervals (if contoured), date data was obtained, and map date. All maps, figures, diagrams and cross sections submitted must be legible and unless otherwise approved by the Department, not larger than 11 inches by 17 inches and must be folded to a standard report format (8.5 inches by 11 inches).

6.0 MANAGEMENT OPTION 3

Management Option 3 (MO-3) provides for: (1) the development of site-specific RS using site-specific exposure and environmental fate and transport data; and (2) the evaluation of all environmental media (i.e., soil, groundwater, air, surface water, sediment, and biota), fate and transport pathways, and exposure pathways. The MO-3 RS shall address the protection of human health, the prevention of cross-media transfer, and the protection of resource aesthetics.

Site-specific RS shall be developed for all exposure and media transfer pathways of concern at the AOI and the limiting RS shall be identified for comparison to the AOIC and groundwater CC (refer to Section 2.8) for the AOI. If the AOIC and groundwater CC for all COC are less than or equal to the MO-3 limiting RS for each impacted medium, then typically, NFA-ATT is required. If the AOIC or groundwater CC for a COC is greater than the MO-3 limiting RS, then the AOI for that medium shall be remediated to the site-specific MO-3 limiting RS and the Submitter shall comply with closure and post-closure requirements. In addition to the requirements presented this section, MO-3 evaluations shall comply with the guidelines presented in Section 2.0 and Appendices B, D, G, and H.

In general, a site-specific approach under MO-3 requires additional site evaluation, a more extensive exposure assessment and documentation of exposure conditions, and the application of more sophisticated fate and transport models. However, the scope of MO-3 is dependent on the complexity of exposure and cross-media transfer pathways at the AOI.

General data requirements for Management Option 3:

(1) Historical information related to the release (if known);
(2) Site investigation data and supporting QA/QC data;
(3) Geology, hydrology, and hydrogeology of the AOI;
(4) Identification of COC and media impacted;
(5) Distribution of the constituent concentrations present within the AOI (refer to Appendix B for site investigation requirements and Section 2.4 for data quality requirements);
(6) Maximum or 95%UCL-AM constituent concentration in soil;
(7) SQL for non-detect results;
(8) Horizontal and vertical boundaries of the AOI;
(9) Environmental fate and transport pathways for constituent migration and site-specific environmental fate and transport data;
(10) Groundwater classification of the zone of concern based on aquifer yield or TDS; location, depth, and use of groundwater wells within a 1-mile radius; thickness of the groundwater plume (S_d); CC at the POC; POE; distance to the nearest downgradient property boundary (if applicable); designated use of, and distance to, the nearest downgradient surface water body (if applicable);
(11) Area (acres) of impacted soil;

(12) Distribution of the constituent concentrations present within the AOI (refer to Appendix B for site investigation requirements and Section 2.4 for data quality requirements);
(13) SPLP data (optional);
(14) Site-specific exposure data and supporting documentation;
(15) Critical effects/target organs for each COC that elicits noncarcinogenic health effects; and
(16) Receptors and exposure pathways associated with current and future land use.

If there are public health concerns associated with exposure to constituents present at or migrating from the AOI, further evaluation and/or recommendations from LDHH/OPH may need to be incorporated into the decision-making process.

6.1 Management of an AOI Under MO-3

Any AOC or AOI may be managed under MO-3. A NFA-ATT determination shall only be considered for an AOC or an AOI where the source of the release has been removed or mitigated. The Submitter may choose to proceed through the SO, MO-1, and/or MO-2 prior to managing the AOI under MO-3, or the Submitter may proceed directly to MO-3.

6.2 Management Option 3 Workplan

Prior to conducting a MO-3 assessment, the Submitter shall submit a detailed workplan for Department approval. The work plan shall include:

(1) A description of the site including history, setting, size, geology, hydrology, and hydrogeology; the longitude and latitude of the primary facility entrance and location method;
(2) Topographic map with the AOC or the AOI labeled and name of quadrangle; vicinity map with adjoining properties, cross streets and land use;
(3) A site map with all significant features;
(4) Available site investigation data;
(5) Preliminary identification of the AOI and COC and a detailed AOI map with all sampling locations or proposed sampling locations;
(6) Identification of any known data QA/QC issues;
(7) A description of current and future land use at the AOC or the AOI and adjacent to the AOC or the AOI;
(8) Preliminary CSM which identifies the sources, media of concern, fate and transport pathways, exposure pathways, exposure points, and receptors;
(9) A description of groundwater use at and in the vicinity (one-mile radius) of the AOC or the AOI, groundwater classification of the aquifer of concern and supporting documentation;
(10) Preliminary identification of site-specific fate and transport data collected to date;
(11) Identification of site-specific and default exposure data to be used in the development of the RS;

(12) Identification of the model(s) to be used, a discussion on the appropriateness of the model(s) for site conditions, model inputs, and model documentation;
(13) Preliminary identification of COC for which EPA toxicity values are not available and the methods that will be used to assess these COC;
(14) Preliminary identification of chemical/physical parameters;
(15) Identification of the proposed use of background levels, ARAR, or quantitation limits as RS;
(16) Proposed target risk level that will be used in the development of the MO-3 RS;
(17) If further site characterization is proposed, data quality objectives; analytical methods, sample quantitation limits, data QA/QC, data evaluation/validation, and data usability;
(18) Summary of the SO, MO-1, and/or MO-2 if conducted; and
(19) RECAP Form 18 Ecological Checklist.

6.3 Exposure Assessment for Management Option 3

Site-specific exposure assumptions representative of a RME scenario for the identified receptor activity patterns at the AOI shall be used in the development of the MO-3 RS. The RME shall be estimated using protective assumptions regarding exposure (intake or contact rate, exposure frequency, exposure duration, body weight, etc.) at the AOI. Site-specific exposure data and environmental fate and transport data are subject to Department approval. In the absence of site-specific exposure data, protective default exposure assumptions consistent with current EPA recommendations shall be used.

Site-specific exposure data shall be used when available and shall be accompanied by supporting documentation. If the site-specific exposure time and/or exposure frequency is significantly less than the standard exposure frequency for an industrial scenario (8 hours/workday; 250 days/year), **financial assurance and institutional controls may be required** depending on site-specific considerations such as current and future land use and receptor activities at, and in the vicinity of, the AOI. Exposure time (hours/day) may be considered in the development of RS when exposure time is necessary for the estimation of contact rate, such as for the ingestion of chemicals in surface water while swimming pathway, the dermal contact with chemicals in water pathway, the inhalation of airborne (vapor phase) chemicals pathway (industrial land use only), and the inhalation of airborne particulates pathway (industrial land use only) (*Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A,* EPA 1989). Exposure time shall not be included in the estimation of exposure via the ingestion of water, ingestion of soil or sediment, inhalation of volatile emissions from groundwater to indoor air during household (residential) use of the water, dermal contact with soil or sediment, ingestion of biota, or other exposure pathways that do not require the consideration of exposure time to estimate contact rate for the calculation of chemical intake (*Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part B, Development of Risk-based Preliminary Remediation Goals,* EPA 1991; *Soil Screening Guidance*, EPA 1997; *Risk-Based Concentration Table*, EPA Region III; *Preliminary Remediation Goals*, EPA Region IX). **The Submitter shall ensure that the**

property remains suitable for commerce and, at a minimum, suitable for industrial use.

All methods/models, input parameters, and calculations used in the estimation of exposure shall be clearly presented and fully documented and referenced in the MO-3 submittal.

6.4 Development of MO-3 Site-Specific RECAP Standards

The RS applicable under MO-3 are described in Section 2.12. The MO-3 RS shall be developed for each impacted medium, receptor population, exposure pathway, and environmental fate and transport pathway identified at the AOI in accordance with the guidelines in Appendix H. For media and/or pathways not included in Appendix H, the MO-3 RS shall be developed in accordance with current EPA methods and recommendations and shall be subject to Department approval.

The MO-3 RS shall consider the protection of human health, the prevention of cross-media transfer, compliance with ARAR, and the protection of resource aesthetics. The target risk (TR) and/or target hazard quotients (THQ) shall be determined in accordance with guidelines presented in Section 2.14. Site-specific and default exposure assumptions, target risk, target hazard quotient, and site-specific and default fate and transport assumptions used under MO-3 are subject to Department approval. **The MO-3 RS are subject to Department approval prior to application at the AOI.** The MO-3 RS are site-specific and therefore are only applicable at the AOI for which they were developed. The MO-3 RS developed for one AOI shall not be applied at another AOI unless it is adequately documented that the RS are appropriate for the AOI and the Department concurs with the decision. **A MO-3 RS submitted without the appropriate documentation will not be approved by the Department.** Refer to Section 6.9 for detailed guidance on the submittal requirements for a MO-3 assessment.

6.5 Application of the MO-3 RECAP Standards

The site-specific MO-3 RS shall be compared to the AOIC and groundwater CC as defined in Section 2.8. If: (1) the AOIC for all COC present in all impacted media; and (2) the groundwater CC for all COC present in groundwater are less than or equal to the MO-3 limiting RS, then typically no further action is required at this time. Requests to the Department for an NFA-ATT determination under MO-3 shall demonstrate that: (1) the MO-3 RS address all impacted media, constituents, receptor populations, exposure pathways, cross-media transfer pathways of concern at the AOI; (2) the MO-3 RS address the protection of resource aesthetics; (3) the MO-3 RS comply with ARAR; (4) the MO-3 RS address cumulative exposure for current and future land use; (5) the MO-3 were developed in accordance with RECAP and have been approved by the Department; (6) the SQL for non-detected constituents are less than the limiting RS; (7) application of the MO-3 RS allow for beneficial use of the land and residual constituent concentrations do not result in the removal of property from commerce; (8) ecological risks are not a concern or ecological risks are acceptable; and (9) current site conditions meet the limiting MO-3 RS without the use of removal, decontamination, or control measures.

If an AOIC or groundwater CC (as defined in Section 2.8) exceeds the MO-3 limiting RS (as identified in accordance with the guidelines in Appendix H) for a COC, then the COC/AOI shall be remediated to the MO-3 limiting RS. Refer to Section 2.18 for guidance on demonstrating compliance with the MO-3 RS.

A COC migrating beyond an industrial property boundary to properties that meet the definition for non-industrial land use (refer to Section 2.9) shall be required to meet the non-industrial RS ($Soil_{ni}$) (refer to Section 2.20 for further requirements for addressing offsite migration).

6.6 Alternate MO-3 RECAP Standards

In the event it is **technically impracticable and/or economically infeasible** [as determined by a Corrective Action Study (CAS) and the concurrence of the Department] to meet the site-specific MO-3 RS, then the Submitter may develop alternate RS based on the results of a CAS. A CAS shall be required. The CAS shall include the development of the appropriate remedial alternatives for achieving the identified MO-3 RS and include a provision of performance and cost data for use in evaluating these alternatives and selecting a remedy. The CAS shall include where warranted:

(1) Identification of remedial alternatives;

(2) Screening of remedial alternatives;

(3) Performance of treatability studies; and

(4) Evaluation of alternatives.

Department approval is required for the development and application of alternate MO-3 RS. This approach requires more regulatory judgment to determine the required level of remediation dictated by site conditions and the best method to achieve that level of remediation. If warranted, a health risk assessment shall be conducted to determine if interim corrective measures are necessary for the protection of human health.

The description and evaluation of the remedial alternatives will vary with the scope and complexity of the AOI. All remedial alternatives under consideration shall be identified in the CAS. The remedial alternatives screening shall be based on the following criteria:

(1) ***Effectiveness.*** This criterion examines the effectiveness of the alternatives to achieve the MO-3 RS. Alternatives that have been proven to be successful in past use and are capable of achieving the RS shall be retained for evaluation. Alternatives that are innovative technologies may be retained if it is successfully demonstrated to the Department through treatability studies that the alternatives will achieve the RS. Alternatives that have demonstrated the capability of

achieving the RS shall be preferred to those only achieving partial clean-ups, unless other mitigating factors exist. Alternatives that have been proven incapable of achieving the RS may be used if it has been successfully proven to the Department that no known alternatives can achieve the RS;

(2) ***Implementability.*** This criterion examines the technical and administrative application of the alternatives. Factors such as use and readiness of equipment, processes, and services, and the obtaining of any required permits and waivers shall be considered;

(3) ***Costs.*** This criterion examines the relative cost of each alternative in relation to the attainment of the remedial goal; and

(4) ***Regulatory requirements.*** This criterion determines whether or not the alternatives will meet all state and federal ARAR for the location or remedy.

Treatability studies may be conducted to produce performance and cost data to determine if the alternatives will meet the alternate MO-3 RS. Quantitative analytical data shall be included in the treatability study to gauge effectiveness in meeting the RS. An analysis of the remedial alternatives shall present a detailed comparison of the relative performance of each alternative using:

(1) Ability of the alternative to achieve the RS;

(2) Long-term effectiveness and permanence considering engineering reliability and institutional controls;

(3) Reduction in toxicity, mobility, and volume;

(4) Treatment residuals that will be left at the AOI;

(5) Short-term effects, including protection to the community and workers during the implementation of remedial actions;

(6) Implementability of the alternative which considers availability of necessary equipment, specialists, technologies, off-site treatment, storage and disposal facilities; and coordination and approval from other agencies;

(7) Costs - capital costs and operating and maintenance costs; and

(8) Compliance with state and federal ARAR.

Corrective actions and closures shall be protective of human health and the environment. The Submitter shall have the responsibility of demonstrating to the Department that the remedial actions and/or control measures proposed or used, effectively abate present and future threats to human health and the environment, to the maximum extent practical. If warranted, a RECAP assessment may be required to quantitate residual risks to health and the environment following remediation and to evaluate the need for institutional controls.

Alternate MO-3 RS shall be accompanied by post-closure care and financial assurance (in accordance with LDEQ guidelines) since conformance with these standards, although providing risk reduction, will result in a higher residual risk than MO-3 limiting RS.

6.7 Uncertainty Analysis

The objective of the uncertainty analysis is to identify the key site-related variables, assumptions, and scientific judgments that contribute most to the uncertainty in the RECAP assessment process. The uncertainty analysis serves to identify areas where additional data collection may significantly improve the basis for deciding how the AOI will be managed. Uncertainties associated with site data, the identification of the COC, toxicity values, and the exposure assessment shall be presented and the potential impact on the outcome of the assessment shall be discussed. For constituents not included in the RECAP assessment, the reason for exclusion and the possible consequences of exclusion on the assessment results shall be discussed. For current and future land uses, the sources and quality of information and the confidence level shall be provided. Justification shall be given for all pathways not included in the assessment. For cumulative effects, any qualifications regarding the selection of exposure pathways considered to contribute to exposure of the same receptor over the same time period shall be discussed. Key model assumptions shall be presented and the potential impact of each shall be discussed.

6.8 Probabilistic Risk Assessment

Probabilistic techniques may be used to analyze variability and uncertainty in risk assessments. Monte Carlo analysis is the most frequently used probabilistic tool for analyzing variability and uncertainty in risk assessments. Monte Carlo simulation is a statistical technique in which a quantity is calculated repeatedly, using randomly selected values from input probability distributions for each calculation. The results of the simulation approximate the full range of possible outcomes and the likelihood of each. Risk is presented as a frequency distribution graph rather than as a single point risk estimate. Such multiple descriptors of risk serve to provide more complete information on the uncertainty and variability surrounding the risk estimate. Typically, Monte Carlo analysis (and other probabilistic techniques) are used as part of a tiered approach which progresses from simpler deterministic risk estimates (single point estimates of risk) to more complex probabilistic analyses as the risk management situation requires.

Under the LDEQ RECAP, the use of probabilistic techniques is optional. Single-point risk estimates, prepared in accordance with current LDEQ and EPA guidelines, shall be required in conjunction with optional probabilistic techniques. When using probabilistic analysis techniques, the following guidelines* shall be applied:

(1) The purpose and scope of the analysis shall be clearly presented and the assessment endpoints shall be defined.

(2) The methods used for the analysis (including all models used, all data upon which the assessment is based, and all assumptions) shall be documented. This documentation shall include a discussion of the degree to which the data used are representative of the population under study. Also, this documentation is to include the names of the models and software used to generate the analysis. Sufficient information shall be provided to allow the results of the analysis to be independently reproduced.

(3) The application of Monte Carlo and other probabilistic techniques shall be limited to exposure assessment. Only exposure variables shall be used in the Monte Carlo simulation. Reference doses and cancer slope factors shall be entered as single numbers except for specific constituents for which the EPA Office of Research and Development has already approved frequency distributions.

(4) Only significant exposure scenarios and COC shall be included in the Monte Carlo simulation. Calculate single point RME risks for all exposure routes using current guidance. The analysis shall include: (1) those exposure routes for which the RME risk estimates exceed either a cancer risk of 1E-06 or a hazard index of 1.0; and (2) those constituents which contribute 1 percent or more to the total RME risk or hazard index.

(5) Monte Carlo simulation shall only be used to analyze uncertainty and variability.

(6) The report shall include graphs and tables that illustrate and describe each input distribution, distributions of risk for each exposure route, and distributions of total risk (summed across exposure pathways and age groups, as appropriate). The selection of distributions shall be explained and justified. For both the input and output distributions, variability and uncertainty shall be differentiated where possible.

(7) The results of sensitivity analyses shall be presented and discussed in the report.

(8) The presence or absence of moderate to strong correlations or dependencies between input variables shall be discussed and accounted for in the analysis along with the effects these have on the output distribution.

(9) The numerical stability of the central tendency and the higher end (i.e., tail) of the output distributions shall be presented and discussed.

**Region III Technical Guidance Manual Risk Assessment, Use of Monte Carlo Simulation in Risk Assessments*, United States Environmental Protection Agency, Region III, Hazardous Waste Management Division, Office of Superfund Programs, EPA 903-F-94-001; *Policy for Use of Probabilistic Analysis in Risk Assessment at the U.S. Environmental Protection Agency, Guiding Principles for Monte Carlo Analysis* (EPA/630/R-97/001)(EPA, Office of Research and Development, May, 1997); *Report on the Workshop Selecting Input Distributions for Probabilistic Assessments* (EPA/630/R-

98/004). Exposure data for Monte Carlo analyses are available in *Exposure Factors Handbook, Volumes I, II, and III* (EPA 1997).

6.9 Management Option 3 Submittal Requirements

A Management Option 3 Submittal Report shall be submitted to the Department for approval. This report shall, at a minimum, meet the submittal requirements listed below. Any variance from these requirements is subject to Department approval prior to submission of the MO-3 report.

(1) RECAP Form 1 Submittal Summary;
(2) RECAP Form 2 Analytical Data Summary;
(3) RECAP Form 3 Analytical Data Evaluation;
(4) RECAP Form 4 Sampling Information Summary;
(5) RECAP Form 5 Groundwater Monitoring Well Characteristics (if applicable);
(6) RECAP Form 6 Groundwater Monitoring Well Sampling Event Summary (if applicable);
(7) RECAP Form 7 Site-Specific Environmental Fate and Transport Data Summary;
(8) RECAP Form 8 Chemical-Specific Data Summary;
(9) RECAP Form 9 Management Option 3 Site-Specific Exposure Data Summary;
(10) RECAP Form 13 Management Option 3 Summary for Soil 0-15 ft bgs;
(11) RECAP Form 14 Management Option 3 Summary for Soil > 15 ft bgs;
(12) RECAP Form 17 Management Option 3 Summary for Groundwater;
(13) RECAP Form 18 Ecological Checklist;
(14) A summary of the SO, MO-1 and/or MO-2 evaluation (if performed);
(15) Site ranking and justification for the ranking;
(16) A topographic map with AOI labeled and name of quadrangle*;
(17) A vicinity map with adjoining properties, cross streets, and land use*;
(18) A site map with all significant features*;
(19) Identification of the horizontal and vertical boundaries of the AOI for each impacted medium and a detailed AOI map with all sampling locations identified*;
(20) A description of the site including history, setting, size, geology, hydrology, and hydrogeology;
(21) A description of land characteristics (such as surface water bodies) and current and future land use at and in the vicinity of the AOI including identification of receptors;
(22) The groundwater classifications of the zones under evaluation and information used to arrive at this determination and identification of the POC, POE, and CC;
(23) A description of groundwater use at and in the vicinity (one-mile radius) of the AOI including, at a minimum, a DOTD well survey obtained within the last 12 months;
(24) Identification of all known underground utilities (≤ 15 feet bgs) within or adjacent to the AOI;
(25) Conceptual site model (refer to Figure8);

(26) Identification of the AOIC for each COC in each medium (including all calculations and identification of the sampling locations/results used in the calculations) for the AOI;

(27) Documentation for site-specific exposure and fate and transport parameters used in the development of the site-specific MO-3 RS;

(28) Documentation of the methods and calculations used to determine the MO-3 limiting RS; identification of critical effect or target organ/system for each noncarcinogenic COC, and demonstration that the risk-based MO-3 RS have been modified to account for additive effects associated with exposure to multiple COC and/or via multiple pathways/media (including calculations);

(29) If applicable, an environmental fate and transport analysis including identification and justification of models used, a discussion on the appropriateness of the model(s) for site conditions, model outputs, boundary conditions, calibration data and sensitivity analyses, and model limitations and uncertainties;

(30) Identification of the corrective action standards and the areas/media/COC requiring corrective action; and

(31) Identification of landowners, lessees, and/or servitude holders (if applicable, refer to Section 2.20).

*Note: All maps must have a bar scale, legend, north arrow, contour intervals (if contoured), date data was obtained, and map date. All maps, figures, diagrams and cross sections submitted must be legible and, unless otherwise approved by the Department, not larger than 11 inches by 17 inches and must be folded to a standard report format (8.5 inches by 11 inches).

7.0 ECOLOGICAL RISK ASSESSMENT

Ecological risk assessment (ERA) is a process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more chemical stressors. It is a process for organizing and analyzing data, information, assumptions, and uncertainties to evaluate the likelihood of adverse ecological effects in a way that is useful for environmental decision-making. The objectives of the ERA process are to: (1) identify and characterize the current and potential threats to the environment due to the release of a constituent; and (2) identify constituent concentrations that are protective of ecological receptors and natural resources. The ERA functions to: (1) document whether actual or potential ecological risks exist at an AOI; (2) identify which constituents present at an AOI pose an ecological risk; and (3) generate data to be used in evaluating corrective alternatives. Ecological risk assessments performed under the RECAP shall be conducted in accordance with current EPA guidelines (*Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*, EPA 1997). These guidelines shall be used in conjunction with the guidelines presented in RECAP when conducting an ERA.

Ecological risk assessments may range from very simple to complex and resource-demanding. Ecological risk assessments are frequently designed in sequential tiers that proceed from simple, relatively inexpensive, generic evaluations to more complex, site-specific assessments. The outcome of a given level of assessment (tier) shall be to: (1) make a management decision; or (2) continue to the next level of assessment. If the results of the ERA indicate there are no unacceptable risks to ecological receptors, then typically no further evaluation shall be warranted. If the results of the ERA indicate the potential for unacceptable risks to ecological receptors, then the Submitter shall: (1) conduct a more site-specific assessment; or (2) implement corrective action. When appropriate, ecological impacts associated remedial activities shall be evaluated and the results of the evaluation shall be considered in the management of ecological risk at the AOI. An ecological risk assessment shall be considered complete when the Department has sufficient information and confidence in the results of the risk assessment to make a scientifically defensible decision concerning management of the AOI.

Ecological checklist. An ecological checklist shall be used to determine if a tier 1 (screening level) ERA is warranted. The checklist is comprised of questions concerning on-site and off-site land uses, characteristics of the environmental setting, the extent of migration, and potential impacts to ecological receptors and/or their habitats. When completing the ecological checklist, current as well as potential future impacts to receptors and/or their habitats shall be considered. If it is determined from the checklist that no significant ecological impacts are occurring or could occur, then no further evaluation shall be required. If it is determined that ecological impacts are occurring or could occur in the future, then a tier 1 ERA shall be conducted. The ecological checklist is presented in Appendix C, Form 18.

Screening-level assessment. A tier 1 (screening level) ecological risk assessment shall be a simplified assessment conducted with limited site-specific data. Where data are lacking, protective default assumptions shall be used. At the screening level, it is important to minimize the chances of concluding that there is no risk when in fact a risk exists. Thus, for exposure and toxicity parameters for which site-specific data are lacking, assumed values shall be biased in the direction of overestimating risk. This ensures that an AOI that may pose an ecological risk is studied further. For screening methods based on the hazard quotient method, an acceptable hazard quotient (or hazard index) shall be defined as 1.0. Higher tier assessments shall incorporate site-specific data (as appropriate) for the assessment of exposure and potential ecological risks. All site-specific data shall be adequately documented. *Ecological Soil Screening Level Guidance* (EPA 2000) shall be used where determined to be applicable by the Department.

Data requirements. Refer to Sections 2.3, 2.4, and 2.5 for guidelines on site investigation, data QA/QC, and data evaluation/usability. For the collection of biological samples, guidelines may be obtained from *Superfund Program Representative Sampling Guidance Volume 3: Biological, Interim Final* (EPA 1997). For ecological assessments, surface soil shall be defined as soil present from the ground surface to a depth of 3 feet bgs. Subsurface soils shall be defined as soils present at depths greater than 3 feet bgs.

Conceptual site model. A CSM shall be developed for the ERA in accordance with current EPA guidelines (EPA 1998). The CSM shall address all current and potential future impacts to ecological receptors and/or their habitats. The CSM shall identify the known or potential constituent source(s) (primary as well as secondary and tertiary sources if applicable), routes of constituent migration, exposure media, exposure points, receptors (assessment endpoints), and measurement endpoints (where applicable) to be evaluated under the RECAP. The CSM shall be used throughout the RECAP ERA process to identify exposure and source media, current and future environmental transport pathways, current and future exposure points and receptors/habitats, and identify data gaps. The CSM shall be revised as the AOI progresses through the tiers of the ERA so that the model illustrates only those sources, migration pathways, exposure and/or source media, exposure points, receptors/habitats (assessment endpoints), and measurement endpoints identified for further evaluation under the tier currently being implemented (i.e., sources, exposure/source media, migration pathways, exposure points, and receptors eliminated from further consideration at the conclusion of a given level of assessment shall be excluded from the CSM for the next level of assessment).

Constituents of ecological concern (COEC). All constituents detected in at least one sample (refer to Section 2.6) shall be identified as COEC for the tier 1 (screening level) assessment. The results of the screening-level assessment shall be used to identify which constituents warrant further evaluation and which may be eliminated from consideration in the next level of assessment. Those constituents found to pose negligible ecological risk during a given level (tier) of assessment may be eliminated from the list of COEC for the next level of assessment. The rationale for eliminating a constituent shall be thoroughly documented in the assessment submittal. It is important to recognize that the COEC may be different from the COC identified in the health risk assessment because of differing exposure pathways, receptor sensitivities, and receptor responses to constituents.

AOIC. For the estimation of the AOIC for screening-level ERAs, the maximum detected concentration shall be used. For other levels of assessment, the maximum detected concentration or the average concentration (unless skewed due to sampling bias) shall be used as the AOIC.

Ecological effects. NOAELs, LOAELs, exposure-response functions, and the mechanisms of toxic response shall be identified for each COEC. When evaluating the potential for adverse ecological effects using the hazard quotient approach, an acceptable total hazard index shall be defined as unity (1.0). Constituents for which toxicity information is limited or unavailable shall be addressed using best professional judgment and the impact of the data gap shall be discussed in the uncertainty analysis.

8.0 SOIL RE-USE UNDER THE LDEQ RECAP

The objective of the soil re-use plan is to allow the use of soils containing residual constituent concentrations that are protective of human health and the environment. It is the intent of the Department that soil be re-used for constructive purposes and **not** as a means of disposal. The Department may grant a one-time soil re-use under LAC 33:VII.303.K, 33:VII.303.L, or 33:VII.305.C. The Submitter shall be required to follow all applicable state and federal laws and regulations prior to re-using soils. Institutional controls shall be implemented as deemed necessary by the Department. In general, soils meeting the limiting soil SS, MO-1 RS, or MO-2 RS shall be considered for re-use. If deemed to be appropriate by the Department based on site-specific conditions, soils meeting the limiting MO-3 RS may be considered for re-use. The RS, DF2, DF3, DAF2, and DAF3 shall be based on the area (acres) of land on which the soil will be re-used (for organic constituents, the Q/C parameter for the calculation of the volatilization factor for $Soil_i$ and $Soil_{ni}$ and the S_w parameter for the calculation of the dilution factors/dilution and attenuation factors for $Soil_{GW2}$ and $Soil_{GW3}$ shall be based on a site-specific area of soil). The re-use of soils having constituent concentrations less than or equal to the limiting soil SS, MO-1 RS, MO-2 RS, or MO-3 RS shall receive Department approval **prior** to re-use of the soil. Re-used soil shall not contain COC concentrations that are unacceptable for the intended use of the property (e.g., soils re-used on agricultural land shall not contain COC concentrations that would result in adverse effects on the propagation of crops). A soil re-use plan meeting the requirements listed below shall be submitted to the Department unless these requirements are modified in writing by the Department:

(1) Demonstration that the proposal for re-use is for constructive purposes rather than disposal;

(2) Identification of the area where the soil will be re-used, including current and future land use of the area and, if warranted, an exposure assessment/conceptual site model;

(3) Manner in which the soil will be managed prior to re-use; and

(4) All submittal requirements for the RECAP Option that is being implemented.

Soil re-use under RECAP does not relieve the Submitter from any requirements of LAC 33:V.Chapter 22. Facilities that generate soils on a continuous basis that contain one or more constituents at concentrations that are less than or equal to applicable RS shall secure a re-use permit under LAC 33:VII. Chapter 11.

Unless otherwise approved by the Department, soil re-use shall be performed in accordance with the following requirements.

8.1 Re-Use of Soils On-Site

A soil re-use plan shall be submitted to the Department and the Submitter shall receive approval from the Department **prior** to re-using soil on-site. The soil re-use plan shall include, at a minimum: a) identification of the location(s) selected for the placement of soils; b) identification of the COC in accordance with Section 2.6; c) demonstration that the COC concentrations in the soil to be re-used comply with the limiting soil standard for the option being implemented; d) demonstration that the proposed location of soil placement will not result in unacceptable exposure to off-site receptors nor have adverse impacts to groundwater over time; and e) demonstration that the re-use of the soil is for constructive purposes rather than for disposal purposes.

In general, for soils to be re-used on-site, the following requirements shall be met:

(1) The limiting soil standard shall be identified in accordance with the guidelines presented in Appendix H for the appropriate land use scenario;

(2) Sampling shall be conducted on soils identified for re-use to demonstrate to the Department that the AOIC for the COC are less than or equal to the limiting soil standard. The AOIC shall be determined in accordance with the applicable guidelines in Section 2.8. The sampling data shall comply with the data requirements in Sections 2.4 and 2.5;

(3) If soil re-use results in higher COC concentrations at the surface than were present before soil re-use, then a six-inch layer of unimpacted soil shall be placed on top of the re-used soil;

(4) The submittal requirements for the option implemented shall be met; and

(5) A conveyance notification shall be placed on property where soils were re-used that contained residual constituent concentrations that exceed the non-industrial risk-based RECAP Standard ($Soil_{ni}$, refer to Table 2).

8.2 Re-Use of Soils Off-site

Approval for the off-site re-use of soils shall be obtained from the Department and will be determined on a case-by-case basis at the discretion of the Department. A soil re-use plan shall be submitted to the Department and the Submitter shall receive approval from the Department **prior** to re-using soil off-site. The soil re-use plan shall include, at a minimum: a) identification of the location(s) selected for the placement of soils and current and future land use at that location(s); b) identification of the COC in accordance with Section 2.6; c) demonstration that the COC concentrations in the soil to be re-used comply with the limiting soil standard for non-industrial land use; d) demonstration that the proposed location of soil placement will not result in unacceptable exposure to off-site receptors nor have adverse impacts to groundwater over time; and e) demonstration that the re-use of the soil is for constructive purposes rather than for disposal purposes.

In general, for soils to be re-used off-site, the following requirements shall be met:

(1) Soil placed off-site shall comply with the non-industrial soil limiting SS or RS identified in accordance with the guidelines presented in Appendix H;

(2) Sampling shall be conducted on soils identified for re-use to demonstrate to the Department that the AOIC for the COC are less than or equal to the limiting soil standard for the Option being implemented. The AOIC shall be determined in accordance with the applicable guidelines in Section 2.8. The sampling data shall comply with the data requirements in Sections 2.4 and 2.5;

(3) If soil re-use results in higher COC concentrations at the surface than were present before soil re-use, then a six-inch layer of unimpacted soil shall be placed on top of the re-used soil; and

(4) A RECAP submittal including all of the submittal requirements for the Option chosen shall be submitted to the Department.

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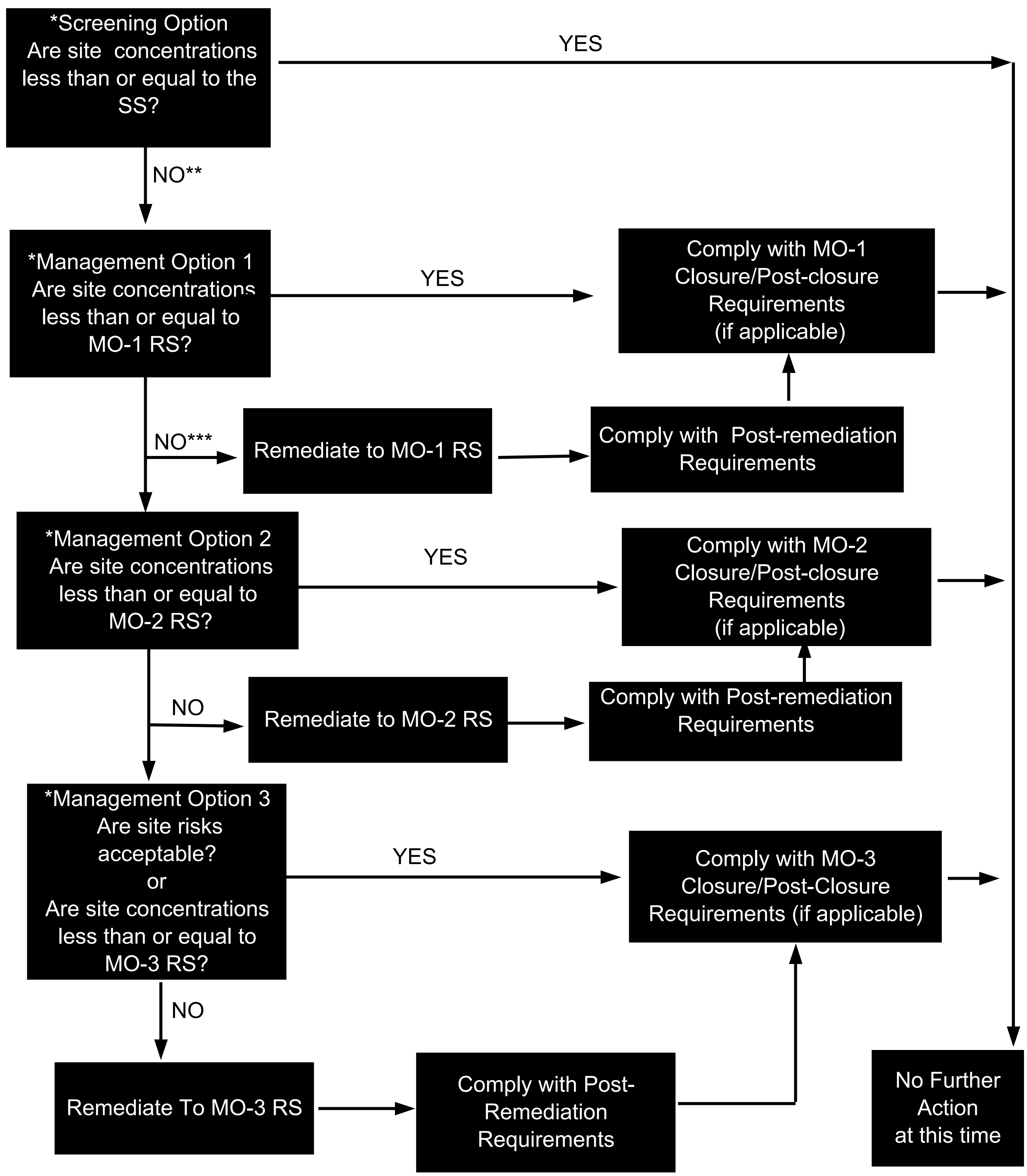
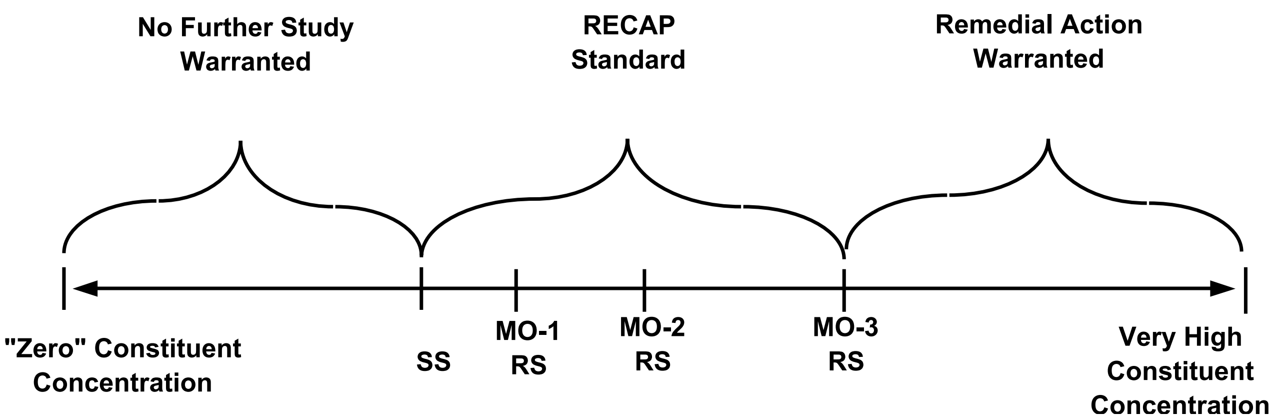
USEPA Supplemental Region VI Risk Assessment Guidance, 1992.

Figure 1:
Overview of LDEQ's
Risk Evaluation/Corrective Action Program



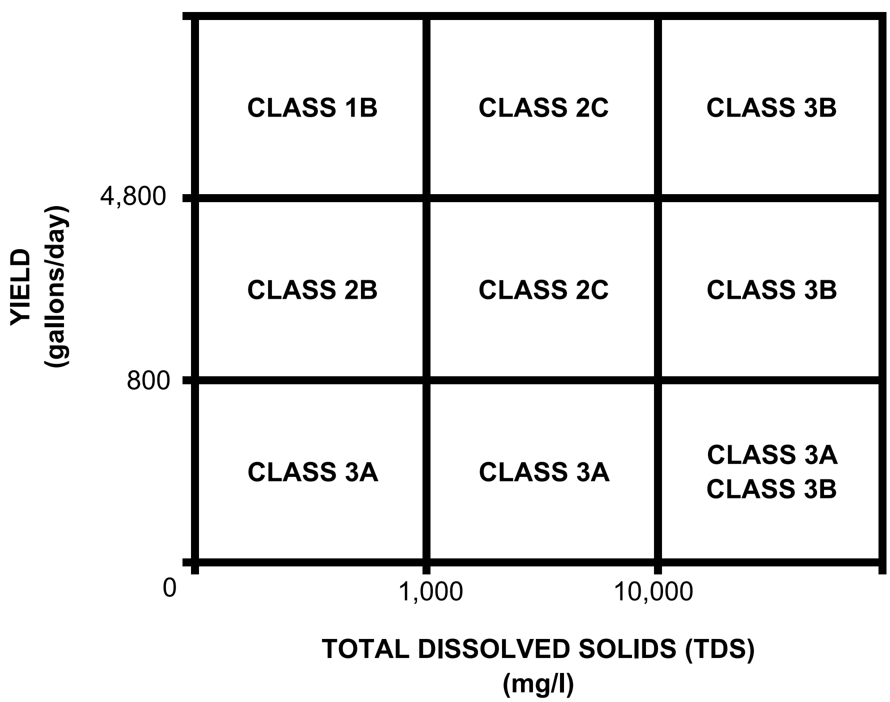
* The submitter may select which option the AOC/AOI is managed under if the AOC/AOI qualifies for management under the option selected.
**The submitter may proceed to MO-1, MO-2 or MO-3.
***The submitter may proceed to MO-2 or MO-3.

Figure 2:
LDEQ Risk Evaluation/Corrective Action Program
Comparison of Screening Standards (SS) and RECAP Standards (RS)



NOTE: MO= Management Option, RS=RECAP Standards SS=Screening Standards

Figure 3:
Groundwater Classification Chart



NOTE:

CLASS 1A - Currently supplies a public water supply.

CLASS 2A - Currently supplies a domestic, agricultural, or other supply.

Figure 4
Identification of the AOI Based on Land Use

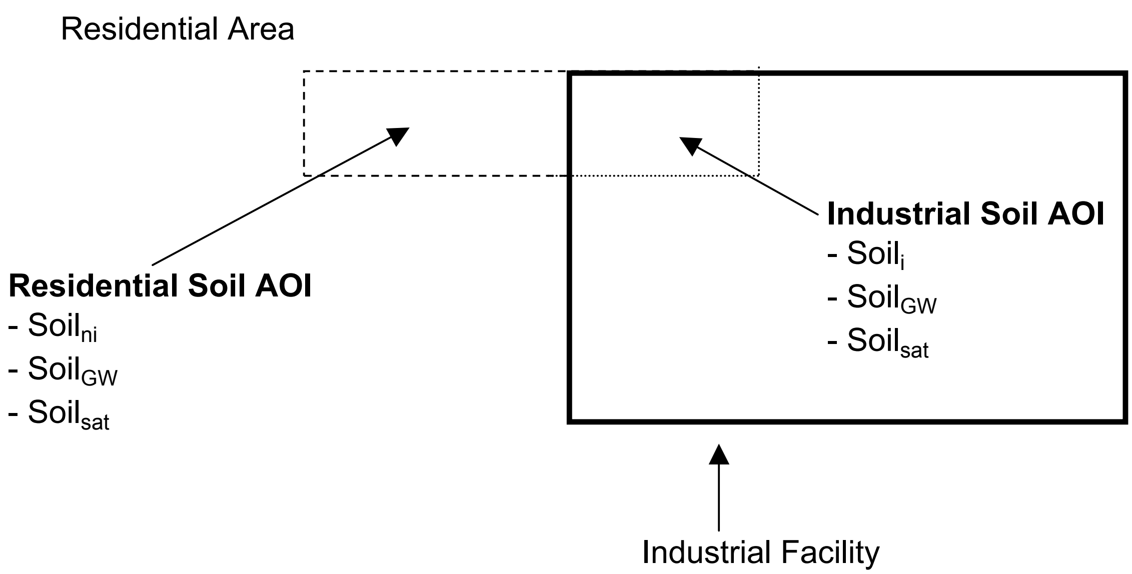


Figure 5
Identification of the AOI for $Soil_{es}$

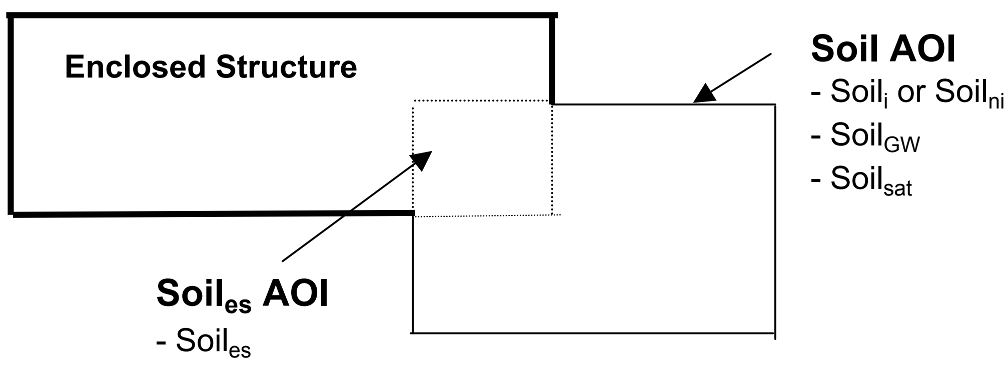


Figure 6
Identification of the AOI for GW_{es}

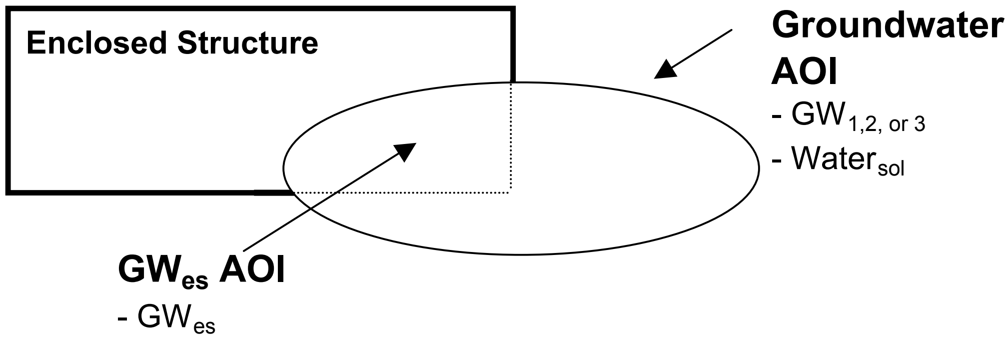
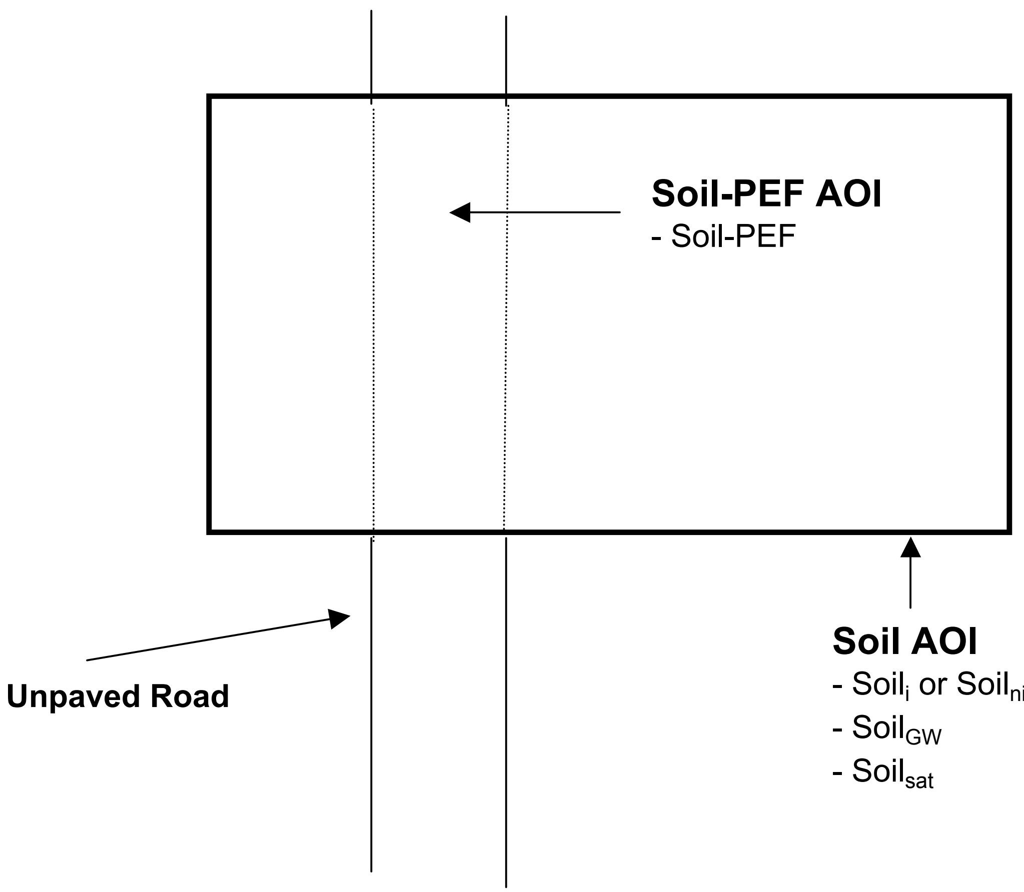


Figure 7
Identification of the AOI for Soil-PEF



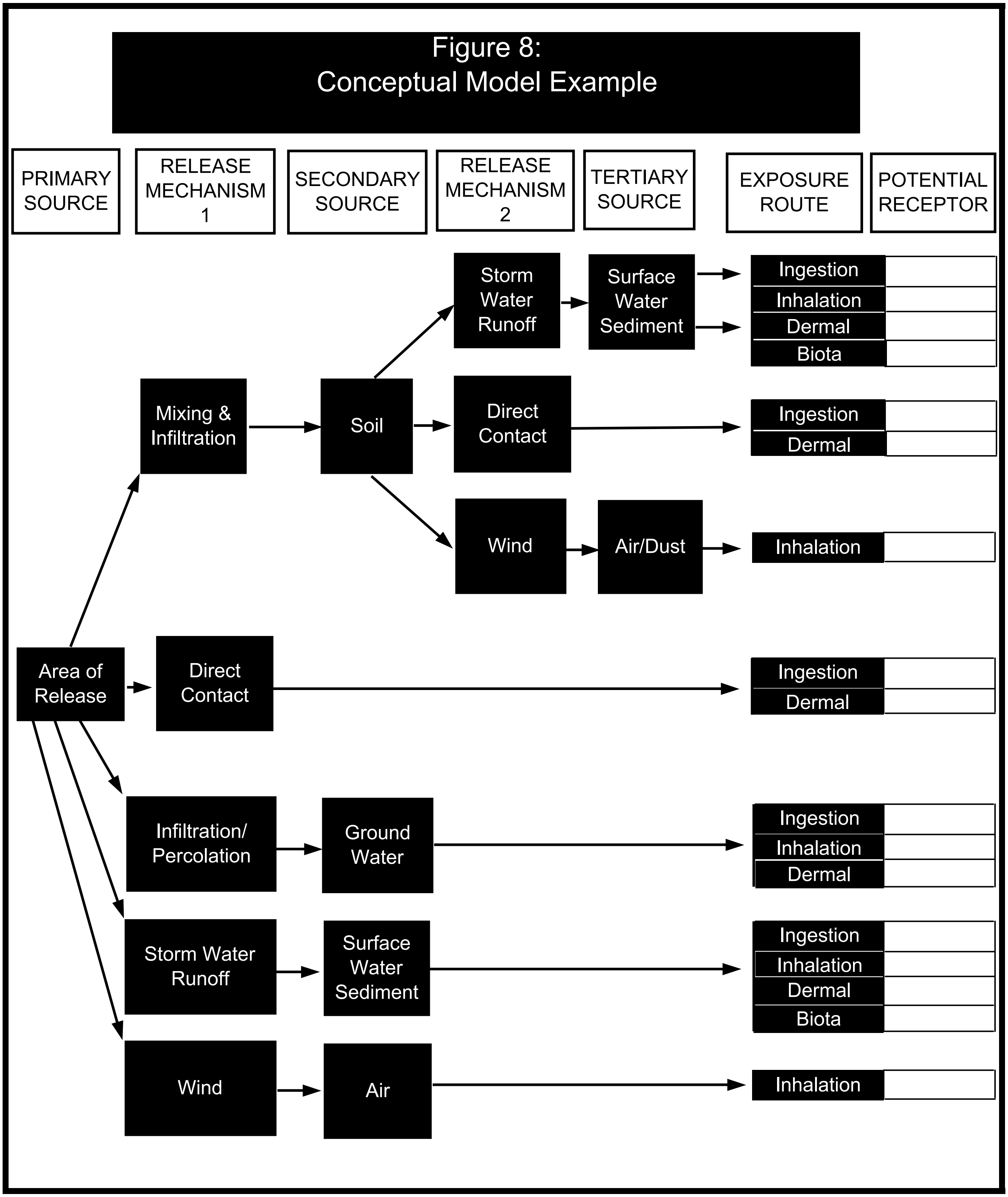
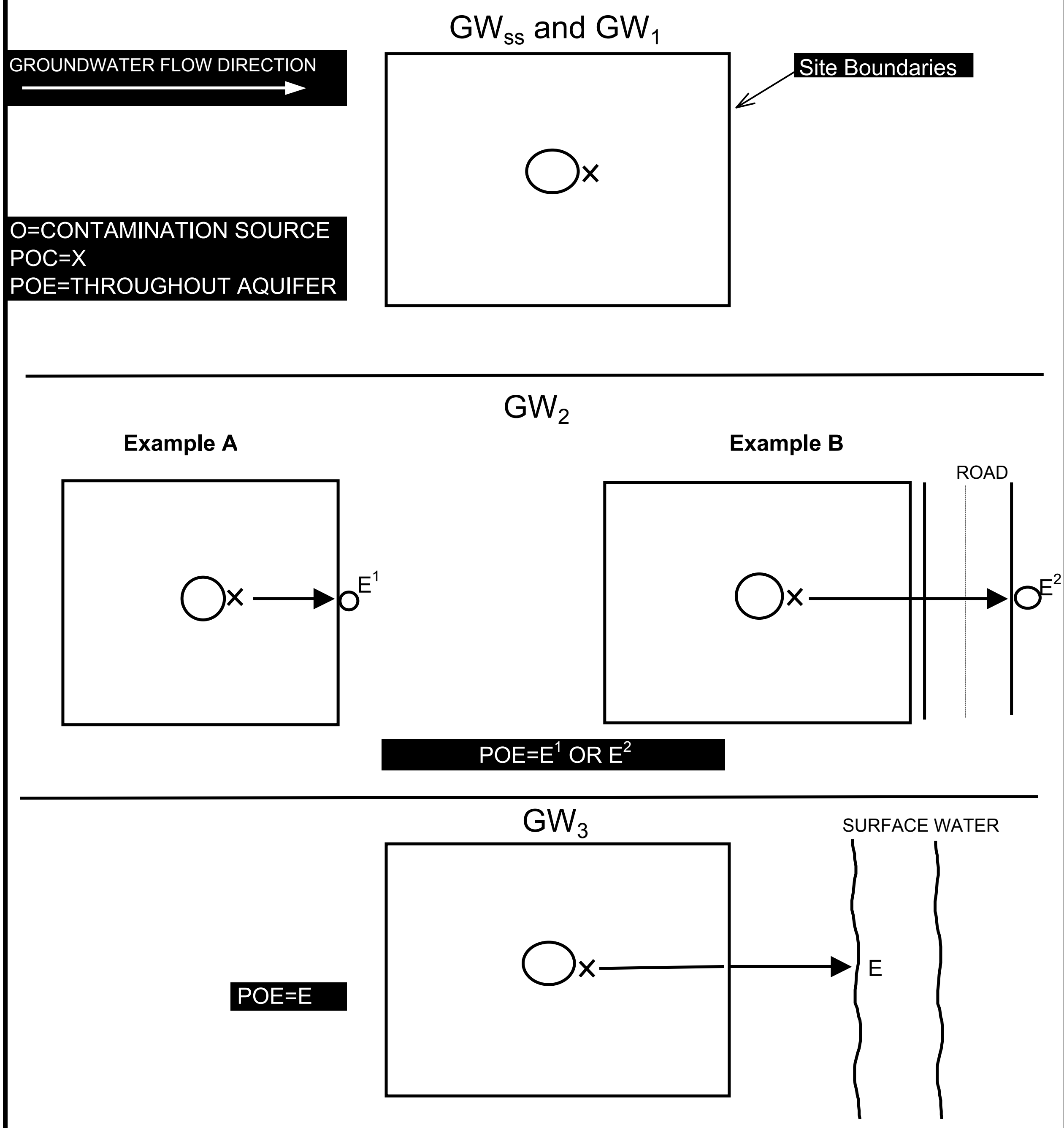


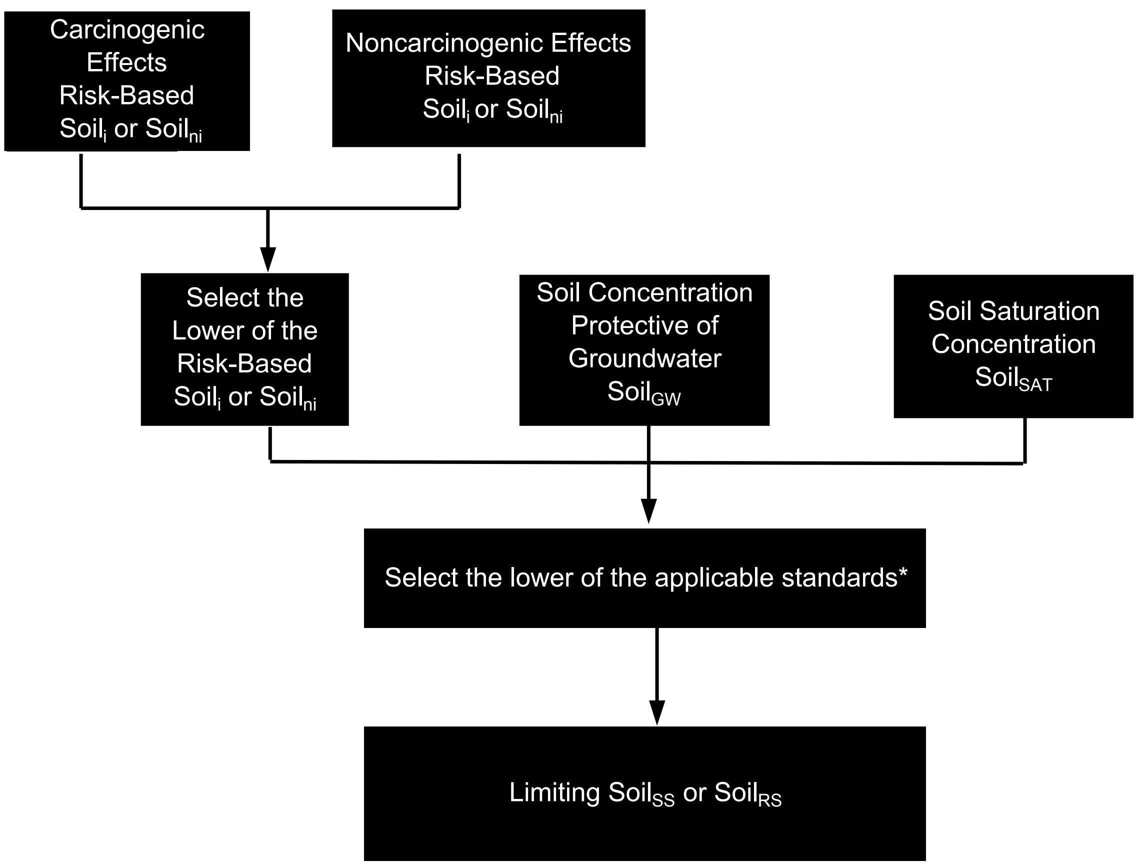
Figure 8:
Conceptual Model Example
PRIMARY SOURCE
RELEASE MECHANISM 1
SECONDARY SOURCE
RELEASE MECHANISM 2
TERTIARY SOURCE
EXPOSURE ROUTE
POTENTIAL RECEPTOR
Storm Water Runoff
Surface Water Sediment
Ingestion
Inhalation
Dermal
Biota
Mixing & Infiltration
Soil
Direct Contact
Ingestion
Dermal
Wind
Air/Dust
Inhalation
Area of Release
Direct Contact
Ingestion
Dermal
Infiltration/ Percolation
Ground Water
Ingestion
Inhalation
Dermal
Storm Water Runoff
Surface Water Sediment
Ingestion
Inhalation
Dermal
Biota
Wind
Air
Inhalation

Figure 9:
Relationship Between Point of Exposure (POE)
and Point of Compliance (POC) for Groundwater



*This figure refers to Section 2.11

Figure 10:
Identification of a Soil Screening Standard or a Soil RECAP Standard*
$Soil_{SS}$ or $Soil_{RS}$



*See Appendix H for methods used to develop $Soil_{SS}$ and $Soil_{RS}$ and the methods for identifying the limiting soil SS or RS.

Figure 11:

Development of Soil Screening Standard for Soil Concentration Protective of Groundwater* ($Soil_{SSGW}$)

Identify the Groundwater Standard (GW_1)

↓

Apply to Soil-Groundwater Partition Equation

↓

Multiply by a Dilution Factor of 20

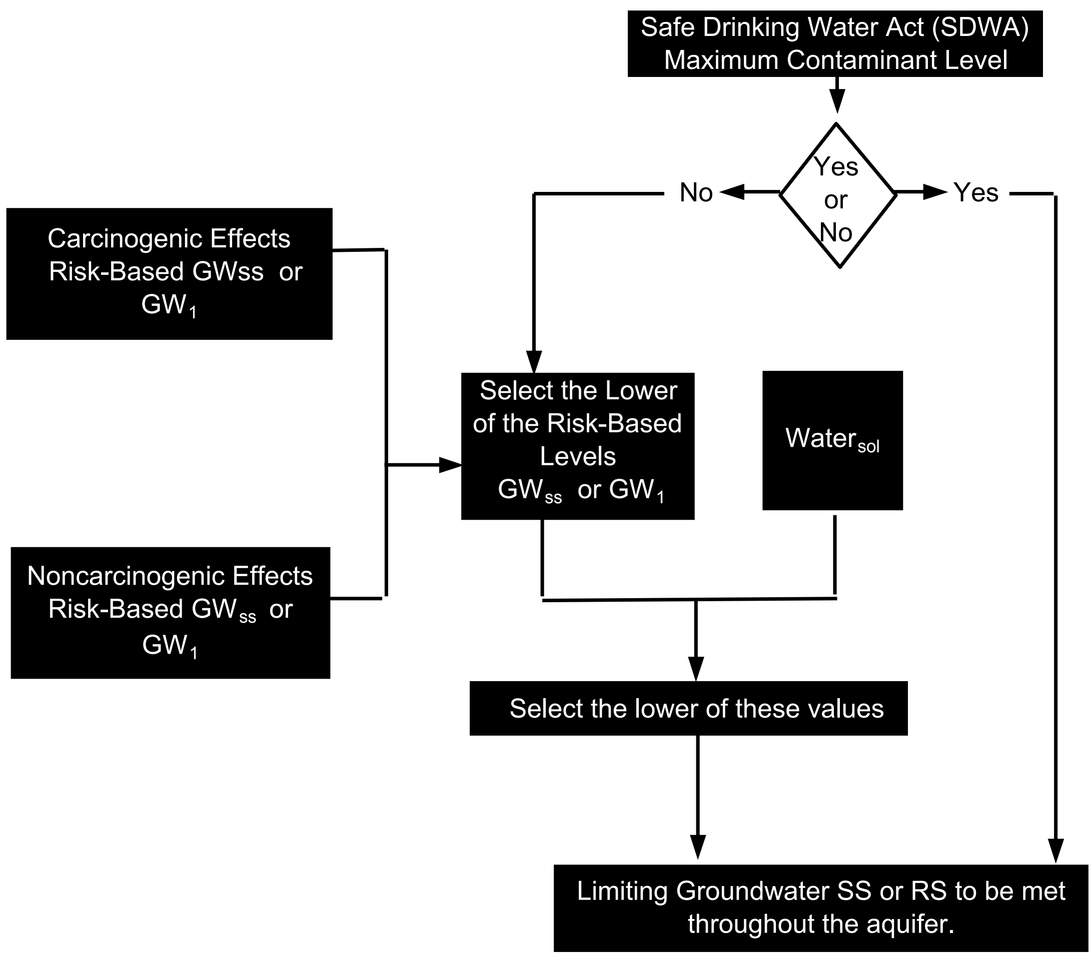
↓

$Soil_{SSGW}$

* See Appendix H for method used to develop the $Soil_{SSGW}$.

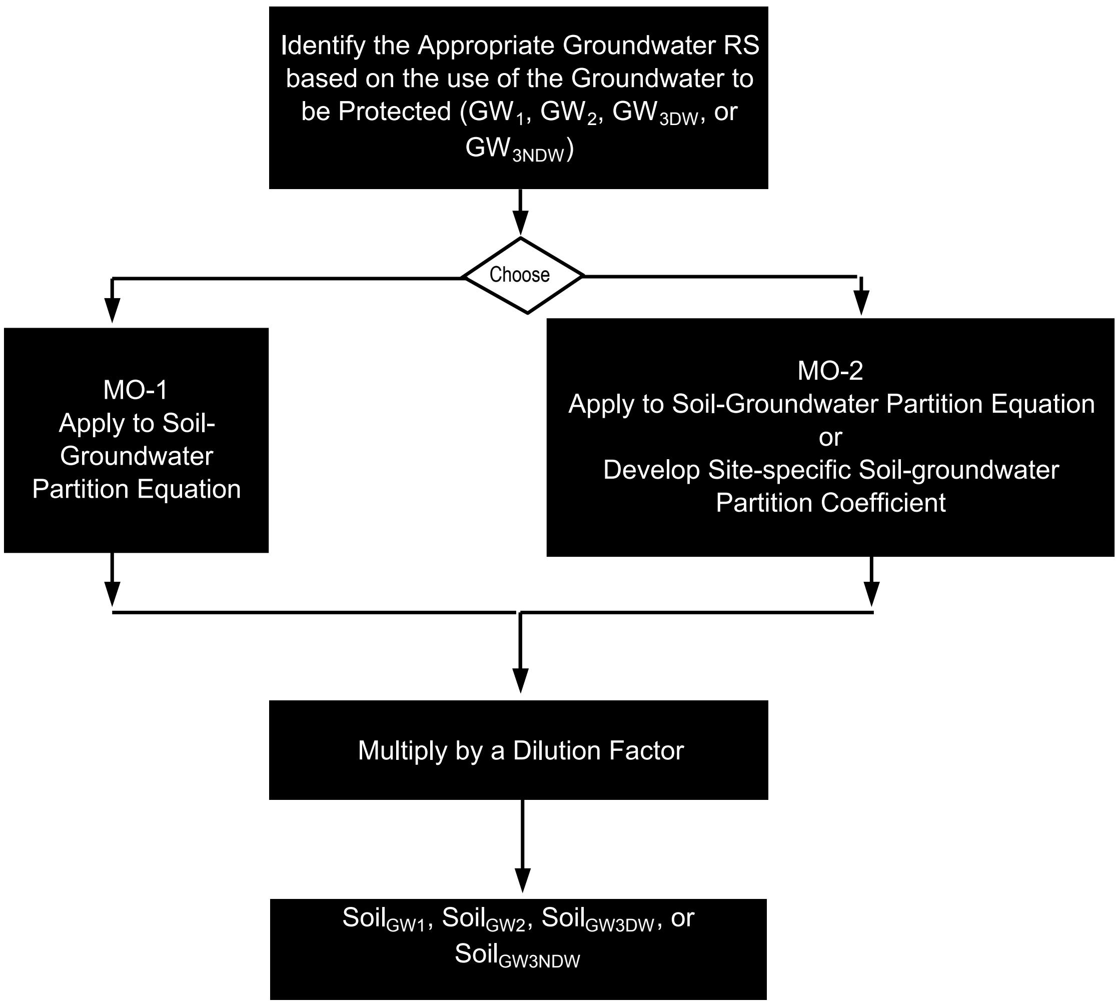
Figure 12:
Development of Groundwater Screening Standard & RECAP Standard for a Groundwater 1 Zone*

(GW_{SS} and GW_1)



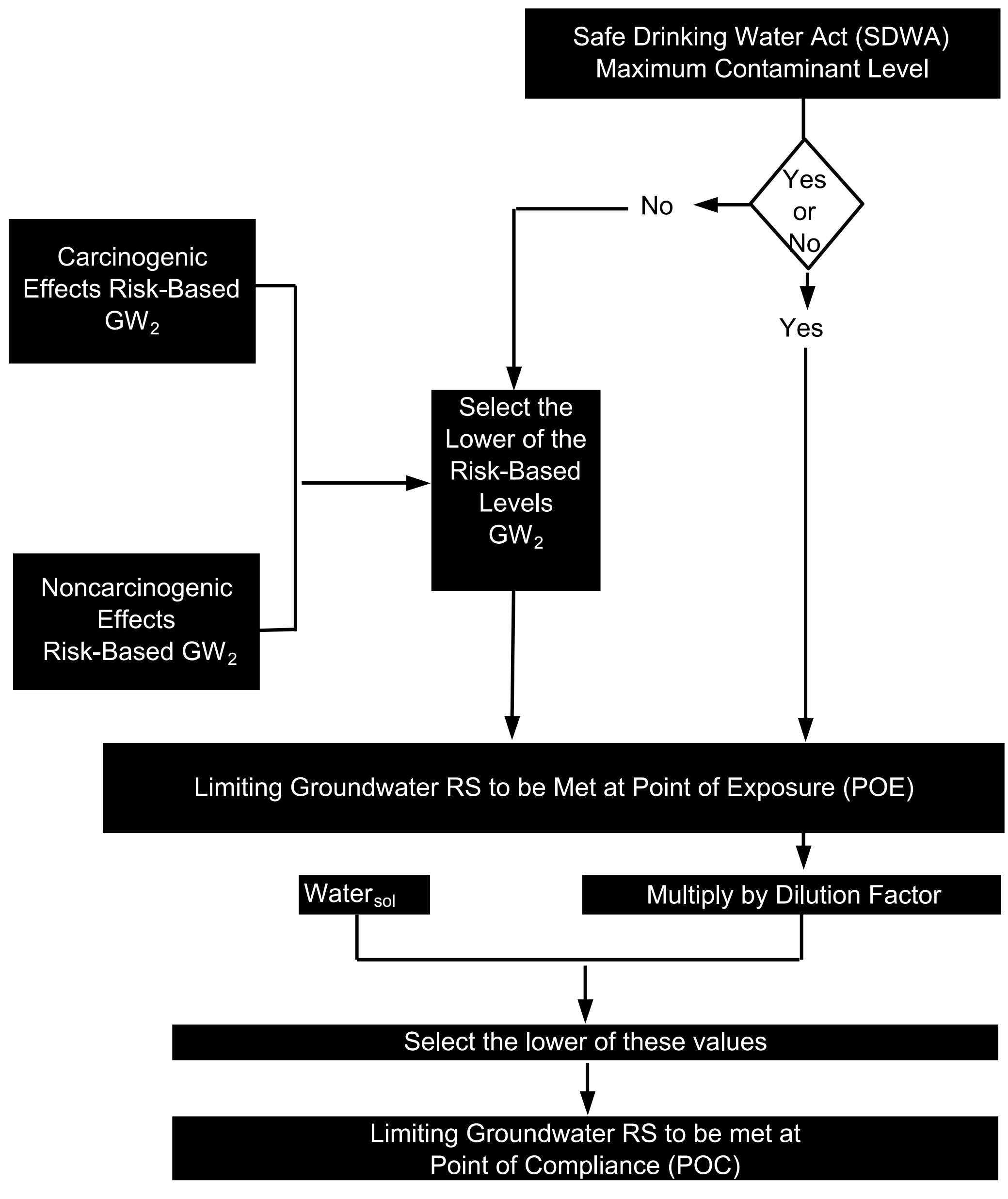
*See Appendix H for methods used to develop GW_{SS} and GW_1.

Figure 13:
Development of Soil RECAP Standard for Soil Concentration Protective of Groundwater*
($Soil_{GW}$)



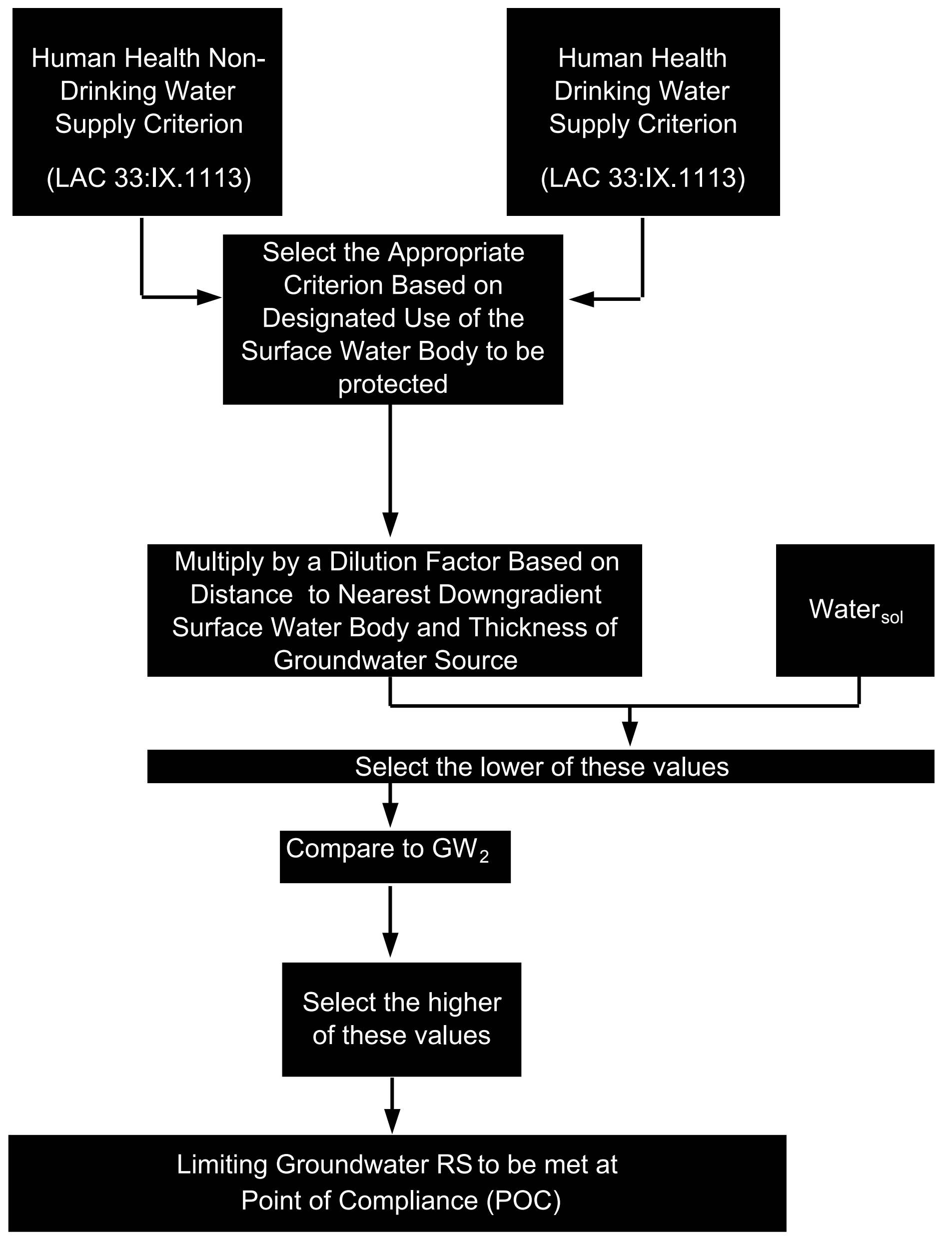
* See Appendix H for methods used to develop the $Soil_{GW}$. In lieu of developing a $Soil_{GW}$, the soil to groundwater pathway may be evaluated using a leach test.

Figure 14:
Development of Groundwater RECAP Standard
for a Groundwater 2 Zone*
(GW_2)



*See Appendix H for methods used to develop GW_2.

Figure 15: Development of Groundwater RECAP Standard for a Groundwater 3 Zone* (GW_3)



*See Appendix H for methods used to develop GW_3.

Figure 16:
Identification of the Limiting RS for Soils Impacted
From Ground Surface to a Depth of 15 feet bgs

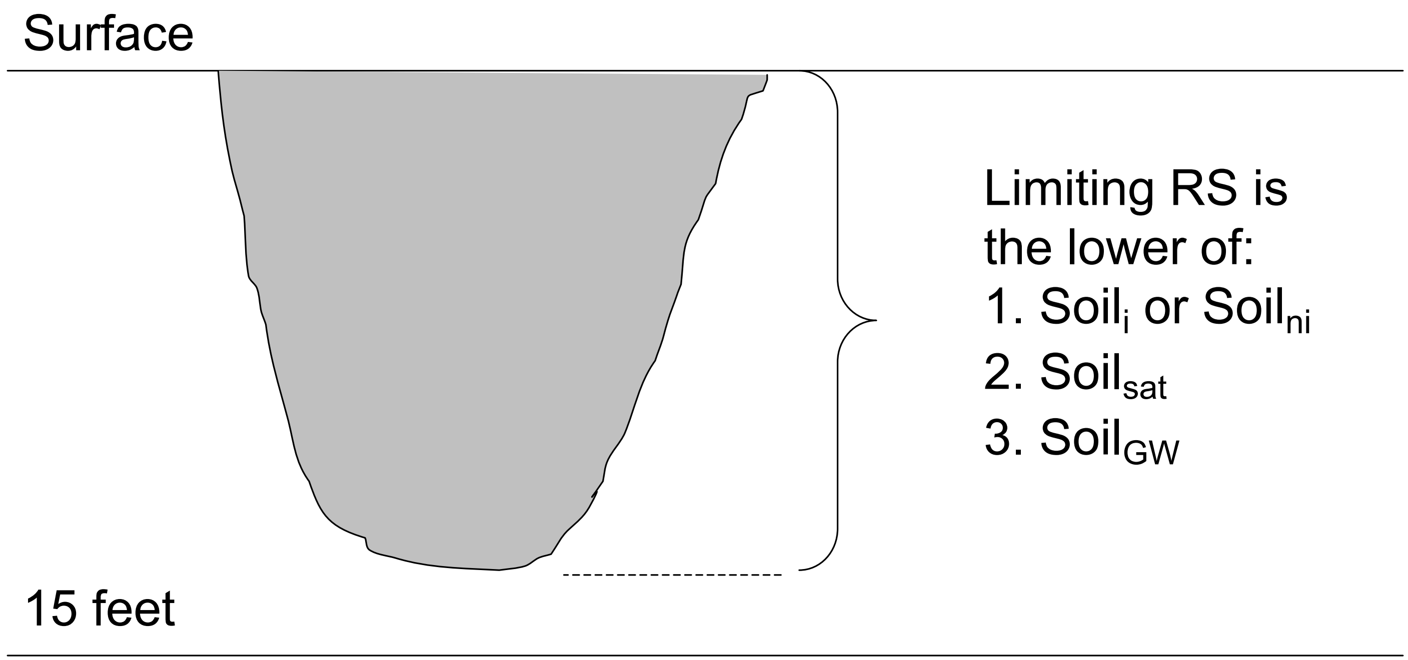


Figure 17:
Identification of the Limiting RS for Soils Impacted From Ground Surface to a Depth of >15 feet bgs

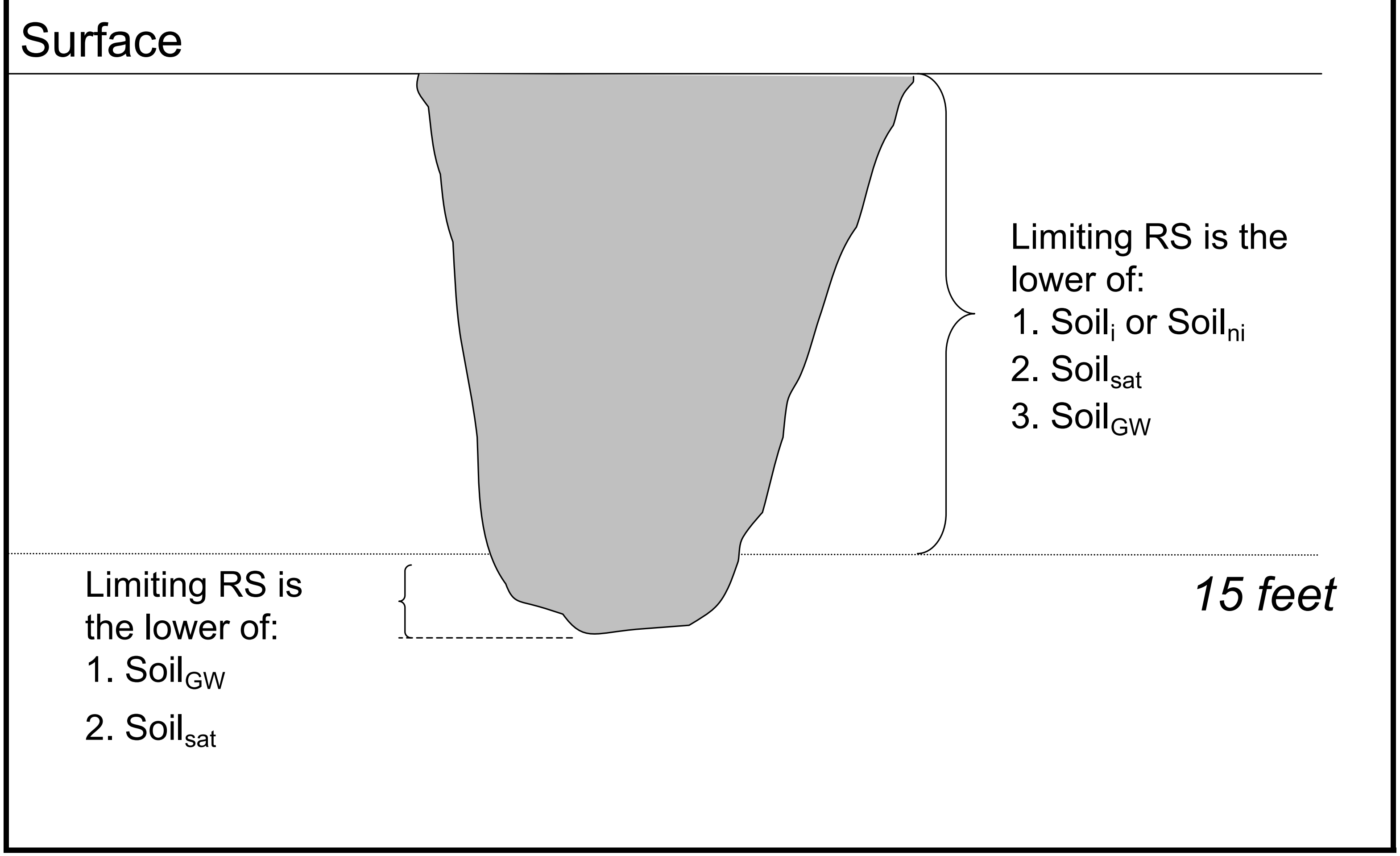
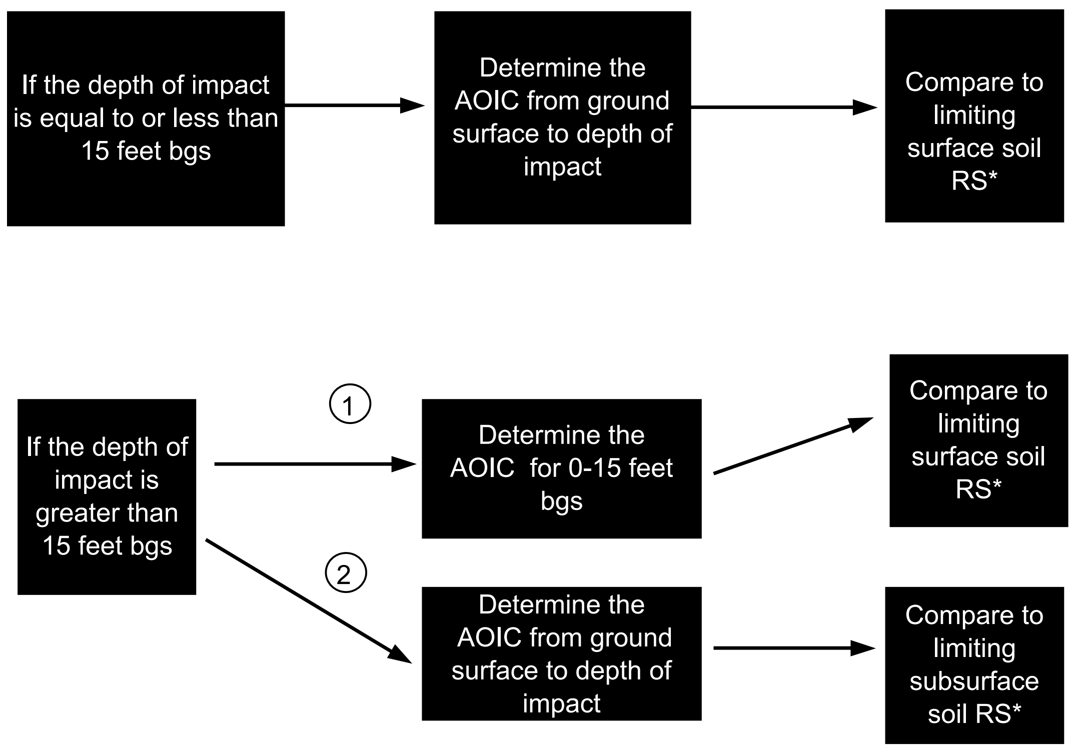
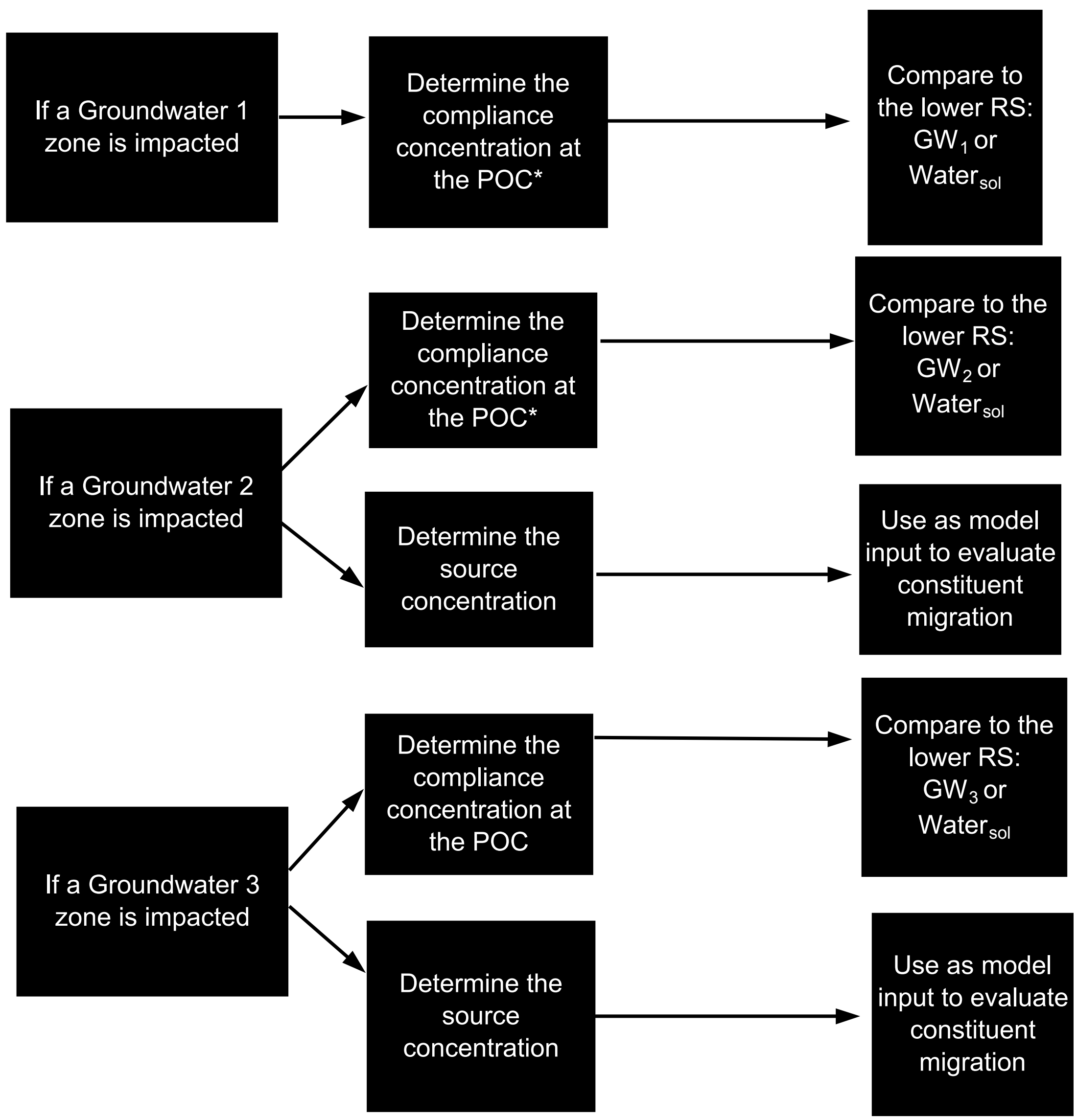


Figure 18:
Identification of AOI Concentration and RECAP Standards for Impacted Soils



* Refer to Appendix H for guidelines on identifying the limiting RS.

Figure 19:
Identification of Compliance Concentration, Source Concentration, and RECAP Standards for Impacted Groundwater



* If exposure to impacted groundwater is occurring, determine the exposure concentration at the POE.
Note: A DAF shall not be applied to a GW RS that is compared to an exposure concentration at the POE.

APPENDIX A

SITE RANKING EXAMPLE

CRITERIA FOR CLASSIFICATION [1]

GROUP I (Immediate threat to human health or the environment)

Examples of these criteria are:

(1) Explosive levels, or concentrations of vapors that could cause acute health effects are present in a residence, other building, or utility system.
(2) An active public water supply well, public water supply line, or public surface water intake is impacted or imminently threatened.
(3) Fish, wildlife, or endangered, threatened, or rare species, sensitive habitats, parks, or wetlands are impacted or immediately threatened by the COCs.
(4) Free-product or other free-phase materials are present in quantities sufficient to threaten sensitive receptors, including but not limited to, individuals or water bodies.
(5) Residents or workers are present within, or the public has open access to, the area affected by COCs and ambient vapors/particulate concentrations exceed acute exposure values.

GROUP II (Short-term threat to human health or the environment)

Examples of these criteria are:

(1) There is a potential for explosive levels, or concentrations of vapors that could cause acute effects, to accumulate in a residence, other building or utility system.
(2) Shallow contaminated surface soils, waste piles, or uncontainerized waste materials are present at significant quantities and open to public access.
(3) A non-potable water supply well is impacted or imminently threatened.
(4) Groundwater is impacted and a public or domestic water supply well or non-potable water supply well is located greater than 500 but less than 1500 feet down-gradient of the known extent of constituents-of-concern (COC).
(5) Groundwater is impacted, and a public or domestic water supply well producing from a different interval is located within the area of investigation (RL/AOI).
(6) Impacted surface water, storm water, or groundwater discharges within 500 feet of a sensitive habitat or surface water body used for human drinking water or contact recreation.

GROUP III (Long-term threat to human health or the environment)

Examples of these criteria are:

(1) Shallow contaminated surface soils (<3ft), waste piles, or uncontainerized waste materials are present in significant quantities and are generally unaccessible to public access (fences or other barriers surround the RL/AOI).
(2) Subsurface soils (> 3 ft BGS) are significantly impacted.
(3) Free product (UST RL/AOIs) may be present, but is located in the immediate vicinity of the source of contamination or is present on top of the groundwater table within the RL/AOI.
(4) Groundwater is impacted and a public or domestic water supply well or non-potable water supply well is located greater than 1500 feet down-gradient of the known extent of constituents-of-concern (COC).
(5) Impacted surface water, storm water, or groundwater discharges within 1500 feet of a sensitive habitat or surface water body used for human drinking water or contact recreation.

GROUP IV (Low likelihood of threat to human health or the environment)

Examples of these criteria are:

(1) Shallow contaminated surface soils (<3ft), waste piles, or uncontainerized waste materials are not present in significant quantities.
(2) Shallow non-potable groundwater with no existing local use is or may be impacted.
(3) Potential for human contact with surface soils, wastes, or sub-surface soils is minimal (the RL/AOI surface is concreted; all wastes are containerized; public access is barred).
(4) All other that do not fit in the above categories.

[1] Modified from ASTM E 1739 Table 1 (ASTM E 1739 Table 1 was produced by Johnson, D. C., DeVaull, G. E., Ettinger, R. A., MacDonald, R. L. M., Stanley, C. C., Westby, T. S., and Conner, J., "Risk-Based Corrective Action: Tier 1 Guidance Manual", Shell Oil Co., July 1993).

APPENDIX B

RECAP

SITE INVESTIGATION REQUIREMENTS

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B1.0 INTRODUCTION, SCOPE, GOALS, AND TERMINOLOGY

B1.1 Introduction

The Louisiana Department of Environmental Quality (LDEQ) has developed this Appendix in order to provide a uniform process for the characterization and investigation of an Area of Concern (AOC) or Area of Investigation (AOI) for the Risk Evaluation/Corrective Action Program (RECAP).

B1.2 Scope

The information provided in this Appendix is applicable to all site investigations conducted under RECAP. Due to the varying complexity of AOC and AOI, strict adherence to this document may not always be possible. This information is provided for the purposes of promoting standardization and consistency in investigation procedures and reporting format for site investigations in order to expedite the investigation and/or remediation processes.

This Appendix sets forth performance-based standards for conducting site investigations under the RECAP. If a site investigation is conducted in accordance with the requirements of this Appendix, the requirement to submit a site investigation workplan to the Department for approval prior to initiating site investigation activities may be waived for a MO-1 or MO-2 submittal. The requirement to submit a site investigation workplan for a MO-1 or MO-2 assessment shall be made on a site-by-site basis by the Department. This allowance does not relieve the Submitter from any statutory or regulatory requirements. A workplan shall be required for all MO-3 RECAP evaluations.

B1.3 Goals

The goals of the Department in developing this Appendix are two-fold: 1) to provide a methodology for characterizing and investigating an AOC or AOI utilizing consistent, scientifically-defensible methods, and 2) to determine the necessity for corrective action and gather information required to make a recommendation regarding any corrective action which may be required. To help meet these goals, the use of innovative technologies and methodologies may be approved by the Department on a case-by-case basis. Examples of innovative technologies and methodologies include the use of minimally intrusive investigation tools, rapid screening techniques, a multi-disciplinary team approach, and real-time data acquisition and analysis. These techniques offer the opportunity to make decisions in the field, resulting in a determination of the full vertical and horizontal extent of the contaminants in all environmental media in an efficient, cost-effective manner.

B2.0 REQUIREMENTS FOR SITE INVESTIGATIONS

The purpose and objectives of the site investigation are to: 1) determine if COC are present; 2) to define the full horizontal and vertical extent of COC in impacted media in the AOI; 3) to identify the source of the release; 4) to determine if receptors have been, or are likely to be adversely impacted; and 5) to determine if an off-site impact has or is likely to occur.

B2.1 Discussion of Preliminary Evaluation Results

Preliminary evaluations are conducted for the purpose of determining if a release of COC to the environment has occurred, i.e., screening of the site under the SO (refer to Section 3.0 of the RECAP document). The SO shall be used to determine if further evaluation of the AOC is warranted. If the screening process indicates that further evaluation is warranted, the SO SS shall be used to identify the AOI and COC for the next level of assessment. Note: If COC are detected at an AOC, applicable LDEQ notification requirements shall be met.

Preliminary evaluation investigations are conducted for the purpose of determining if a release of COC to the environment has occurred, i.e., screening of the site under the SO (refer to Section 3.0 of the RECAP document). Typically, these investigations (e.g. Phase II property transfer investigations) are of limited scope and are not sufficient to obtain a NFA-ATT decision from the Department if constituents of concern are detected. Preliminary evaluations may be used as tools to determine if a release of constituents of concern has occurred provided that the areas most likely to have been impacted are sampled and that all laws, regulations and permit conditions are followed. **Any preliminary evaluations that are self-implemented are done at the risk of the Submitter.** LDEQ may require confirmation sampling for any self-implemented preliminary evaluation where no further action is requested.

B2.2 Development of a Conceptual Site Model

A preliminary Conceptual Site Model (CSM) shall be developed based on the existing site data and shall be used to assist in the development of a Site Investigation Workplan (refer to Section 2.7 and Figure 4 of the RECAP document). It is the Department's preference that data meeting the QA/QC requirements set forth in Section 2.4 of the RECAP document are used for the development of the CSM. However, analytical data that do not meet these requirements may be considered to be acceptable for use in the development of a preliminary CSM. The CSM shall identify the known, potential, or suspected constituent source(s); routes of constituent migration; exposure media, points and pathways; receptors; source media to be evaluated under RECAP; and shall be revised as new data are developed during the site investigation. The CSM shall be utilized to direct sampling efforts to ensure that all potential exposure areas and migration pathways are adequately characterized at each AOC or AOI.

B2.3 Evaluation of Additional Data Needs

Based on an evaluation of existing site data and the CSM, an evaluation of additional data requirements shall be performed. Factors to be considered include the necessity to fully characterize the environmental setting, identification of the vertical and horizontal extent of impact, predicted fate and transport of COC, potential exposure points and pathways and the activity patterns of potential receptors. Additionally, for all analytical data gathered, the intended use of the data shall be considered to assure adequate Quality Assurance/Quality Control (QA/QC) procedures are conducted.

B2.4 Development of a Site Investigation Workplan

Prior to conducting field activities associated with the site investigation for a RECAP evaluation, the Submitter may be required to prepare and submit a Site Investigation Workplan (hereinafter "Workplan") for LDEQ approval. The Submitter shall contact the LDEQ to establish the necessity of a Workplan. The requirement for a site investigation Workplan for a MO-1 or MO-2 evaluation shall be made by the Department based on site-specific conditions. A site investigation Workplan shall be submitted for Department approval for all MO-3 evaluations.

The Workplan introduction shall include the reason for implementation of the preliminary evaluation (if completed). The type of facility currently present on the AOI and uses of adjacent properties shall be described. Details of the notification of release that was provided to LDEQ or any other regulatory agency shall be included. The site history shall include information regarding any former facilities or site activities, especially any that used potential COC, and any historical information regarding possible releases by those former facilities. Dates of operation of former facilities and owners/responsible parties shall be listed chronologically if known. Any available information regarding environmental conditions associated with former operations shall be detailed. The type of facility currently present (such as a chemical plant, petroleum refinery, retail petroleum facility, etc.) shall be described, including all chemicals and raw materials stored or in use in the AOI. The appropriate NAISC code shall be listed (refer to Section 2.9 and Appendix E). Dates and quantities of COC released shall be stated if known. The release mechanism and actions taken to control the release shall be discussed. Maps depicting the AOI general location, the overall layout of the facility, any permitted waste management units, and sampling locations shall be included. Any sampling results shall be detailed with a written description of the sampling procedures, maps showing sampling locations, boring logs, well construction details (if installed), analytical results in tabular format with lab data sheets, and chain-of-custody documentation.

The results of the preliminary evaluation (if completed) shall be summarized. All constituents detected at the AOC shall be listed. The COC should be identified in accordance with Section 2.6 of the RECAP document. Current or potential threats to sensitive receptors shall be included. Any interim measures that have been taken to date, including soil removal, free phase removal, groundwater recovery, capping, etc., shall be specified with recommendations for any additional emergency or interim corrective action warranted at the AOC or AOI.

The site investigation Workplan submittal shall at a minimum, meet the submittal requirements listed below. Any variance from these requirements shall be approved by the Department prior to submission of the site investigation Workplan. Additional information may be required in the workplan depending on statutory, regulatory, or permit-specific issues.

(1) Topographic map with AOC or AOI labeled and name of quadrangle;*
(2) Vicinity map with adjoining properties, cross streets and land use;*
(3) Facility site map with all significant features including the latitude and longitude of the primary facility entrance and method used to collect location data;*
(4) A description of the site including setting, size, geology, hydrology, and hydrogeology;
(5) A description of land use at and in the vicinity of the AOC or AOI;
(6) Detailed AOC or AOI map with all proposed sampling locations;*
(7) A description of groundwater use at and in the vicinity (one-mile radius) of the AOC or AOI, including a DOTD well survey obtained within the last 12 months;
(8) Identification of all known underground utilities (≤ 15 feet bgs) within or immediately adjacent to the AOC or AOI;
(9) Identification of the analytical methods and quantitation limits to be used and QA/QC data to be collected;
(10) Preliminary identification of the COC;
(11) A description of the activities to be conducted at the AOC or AOI;
(12) A preliminary RECAP Conceptual Site Model;
(13) Project/Activity schedule(s) and milestone chart;
(14) A schedule of deliverables/submittals and their due dates;
(15) An organizational chart illustrating the lines of responsibility of the personnel involved in the investigation;
(16) Data management and tracking procedures (if applicable); and
(17) Data evaluation methods and results with regard to data usability for the RECAP.

*Note: All maps shall have a bar scale, legend, North arrow, contour intervals (if contoured), date data was obtained, and map date. All maps, figures, diagrams, and cross sections submitted shall be legible, and unless otherwise approved by the Department, not larger than 11 inches by 17 inches and shall be folded to a standard report format (8.5 inches by 11 inches).

If a site investigation Workplan was prepared, a copy of the Workplan shall be available at the site throughout all field activities. All persons involved in field activities shall be familiar with the Workplan.

Unless otherwise approved, LDEQ shall be notified at least five (5) working days prior to the commencement of all field activities so that, if available, a representative of the Department may be present to witness the investigation activities.

The following documents shall be developed for all sites and submitted to the LDEQ upon request:

(1) ***A Technical Sampling and Analysis (TS&A) Plan***, which includes all sampling required to characterize the surface soil, subsurface soil, surface water, sediment, biota and groundwater as required by the RECAP CSM and a QA/QC Plan. The vertical and horizontal extent of impact shall be defined for each AOC or AOI. All sample points, preliminary COC, proposed analytical methods, and required quantitation limits shall be identified. A sufficient number of sample locations shall be selected to completely define the vertical and horizontal extent of all impacted media and to adequately characterize the AOI. The number and locations of samples shall be properly justified and determined based on EPA SW-846 Chapter 9, Data Quality Objectives for risk-based programs, best professional judgement, and/or LDEQ policy. Sample locations shall be based on site size, site geology and hydrogeology, site topography, migration pathways, points of exposure, and knowledge of sources or potential sources. If this information is unavailable or inconclusive, a grid system may be proposed, but shall be approved by LDEQ prior to implementation. Sample parameters may be based on site history and constituents expected to be present, if justified. Source areas as well as areas of constituent migration shall be sampled. The type and frequency of calibration procedures for field instruments, laboratory instruments (as applicable), internal quality control checks, and quality assurance performance audits and system audits shall be addressed. Preventative maintenance procedures, schedules, and corrective action procedures for field instruments and laboratory instruments (as applicable) shall be specified. The plan shall address sample custody procedures during sample collection, in the laboratory (as applicable), and as part of the final evidence files. The laboratory contracted to analyze samples pursuant to this Workplan shall be accredited as required by the Louisiana Administrative Code (LAC) 33:I, Subpart 3.

(2) ***A Health and Safety (H&S) Plan,*** which shall delineate all necessary precautions for the safety and protection of both personnel involved in site activities and the surrounding community during the implementation of all site work under the approved Workplan. The H&S Plan shall provide a site background discussion and describe personnel responsibilities, protective equipment, health and safety procedures and protocols, decontamination procedures, personnel training, and type and extent of medical surveillance. The H&S Plan shall also identify problems or hazards that may be encountered and how they are to be addressed. Procedures for protecting third parties, such as visitors or the surrounding community, shall also be provided.

(3) ***A Quality Assurance/Quality Control (QA/QC) Plan,*** which shall address limitations and uncertainties associated with the data so that only appropriate and reliable data for use in quantitative risk assessment are carried through the RECAP process. Quality assurance objectives for data shall address the appropriate test methods, quantitation limits, required precision and accuracy, completeness, representativeness, comparability, and intended use of the collected data. The site investigation data shall meet the data requirements presented in RECAP, Sections 2.4, and shall be evaluated as per RECAP, Section 2.5.

Louisiana Motor Fuels Underground Storage Tank Trust Fund Eligible Investigations

Prior submittal of a Workplan for LDEQ review and approval may not be required for site investigations of sites determined to be eligible to participate in the Louisiana Motor Fuels Underground Storage Tank Trust Fund provided the investigation is completed in accordance with this document. However, a statement declaring that the investigation will be conducted in accordance with the requirements of this Appendix and a cost estimate to complete the proposed site investigation shall be prepared and submitted to the LDEQ for approval **prior** to initiation of field activities. The cost estimate shall include all costs related to the completion of the investigation and shall address unit costs should it become necessary to expand the proposed scope of the investigation (horizontally or vertically). Additionally, in order to ensure maximum potential eligibility under the Trust Fund, all site activities shall be conducted in accordance with the latest version of the *Louisiana Motor Fuels Underground Storage Tank Trust Fund Cost Control Guidance Document* and overseen or performed by a Response Action Contractor. Failure to follow these guidelines could result in some or all costs being ruled ineligible for Trust Fund reimbursements.

B2.5 Site Investigation Requirements

The following requirements shall apply to all site investigation activities conducted under the RECAP except where otherwise stipulated, such as in a Cooperative Agreement. Deviations from these requirements may be granted by the LDEQ based upon site-specific conditions. Any deviation from these requirements shall be approved by the Department prior to implementing investigation activities, fully documented in the Workplan, and outlined in the cover letter accompanying the plan. Unless otherwise authorized, all site investigation Workplans shall be approved prior to the initiation of site investigation activities.

(1) A review of LDEQ files and other records pertinent to the site, area or region is recommended prior to implementation of investigation activities.

(2) The Submitter shall be responsible for securing authorization from the appropriate property owners necessary to conduct the investigation, as well as ensuring that all underground utilities are properly located and marked prior to the commencement of the investigation.

(3) The Submitter shall be responsible for ensuring that all applicable licenses, permits, insurance, bonds, QA/QC Plan, TS&A Plan and H&S Plan, are properly in effect and maintained throughout the project life. A copy of the QA/QC Plan, TS&A Plan and H&S Plan shall be on site and available for review during the field activities. The Submitter shall ensure that any subcontractors or other parties involved with the project have complied with these requirements.

(4) Data shall be reviewed to identify reliable, accurate, and verifiable numbers that can be used to quantitate risks. The data shall be reviewed in accordance with the requirements presented in Sections 2.4 and 2.5 of the RECAP document. Specifically, the data shall be evaluated to assess the effect of quality control issues on data usability. All data submitted shall be generated by an accredited laboratory in accordance with LAC 33:I, Subpart 3. The laboratory shall be accredited in those parameters for the applicable test categories.

(5) In general, the site investigation efforts shall include, but may not be limited to:

(a) Identification of the source of the release;

(b) Characterization of all media suspected of being impacted;

(c) Identification of the COC present and their respective concentrations;

(d) Identification of the horizontal and vertical extent of COC impact;

(e) Identification and characterization of migration pathways and receiving media;

(f) Characterization of current or potential off-site impacts;

(g) Collection of data necessary to adequately conduct a RECAP evaluation; and

(h) Collection of data for modeling input (if any is anticipated).

B2.5.1 Sample Locations

A sufficient number of sample locations shall be selected to completely define the vertical and horizontal extent of all impacted media and to adequately characterize the AOC or AOI. The number and locations of samples shall be properly justified and determined based on EPA SW-846 Chapter 9, Data Quality Objectives for risk-based programs, best professional judgement and/or LDEQ policy. Sample locations shall be based on site size, site geology and hydrogeology, site topography, migration pathways, points of exposure, and knowledge of sources or potential sources. If this information is unavailable or inconclusive, a grid system may be proposed, but shall be approved by LDEQ prior to implementation. If the data is determined to be unacceptable (i.e. sample preparation fails to meet specified analytical method requirements, holding times are exceeded, inappropriate quantitation limits are used, etc.), resampling may be required.

B2.5.2 Soil Investigations

All soil investigations shall be performed in accordance with this Appendix, as well as the guidelines established in the latest versions of the LDEQ and LDOTD *Construction of*

Geotechnical Boreholes and Groundwater Monitoring Systems Handbook and the LDOTD *Water Well Rules, Regulations, and Standards.*

The equipment used to advance soil borings shall consist of hollow stem auger, solid stem auger, direct push technology or other methods approved by LDEQ. Hand augers may be allowed if samples collected are not intended for volatile organic analysis or if site conditions make other methods impractical. All drilling rig and sampling equipment shall be decontaminated prior to the start of drilling, between each boring, and before leaving the site by rinsing with a high-pressure washer or other appropriate cleaning method. All investigation derived waste (cuttings, purge water, etc.) shall be collected and properly disposed in accordance with applicable LDEQ rules and regulations. The disposition of the waste shall be discussed within the site investigation report.

Soil investigation techniques shall be performed in a manner to ensure that contamination is not introduced into the borehole and that contamination is not carried from one water-bearing stratum to another.

When sampling soil, undisturbed continuous samples are to be collected from each boring location to determine the vertical depth of impact. At a minimum, sampling shall continue until first water is encountered or until the vertical extent of the impact has been defined. Site-specific conditions or the environmental fate and transport characteristics may necessitate the collection of additional soil samples with depth. The horizontal extent of the AOI shall be defined to the constituent's limiting standard for the Option being implemented as discussed in Section 2.6 of the RECAP document. Each soil sample shall be visually classified by a geologist or engineer in accordance with ASTM Method D2488 and documented on a boring log using the Unified Soil Classification System.

Soil samples are to be collected using a thin-walled sampler (e.g., Shelby tubes), split-spoon samplers, direct push samplers or other sampling tools approved by LDEQ. Soil samples shall be extruded in the field immediately following retrieval of each sampler. A representative portion of each soil sample shall be carefully trimmed to remove the smear zone formed during sample acquisition and split into two portions. One portion shall immediately be placed in a clean sample container appropriate for the method, labeled, and cooled to 4 degrees Centigrade while the other portion shall be placed in a clean 16-ounce glass container, covered with clean aluminum foil, and sealed. The soil in the 16-ounce glass container shall be allowed to volatilize for approximately 15 minutes prior to conducting a headspace screening analysis by penetrating the foil with the probe from a flame ionization detector, a photoionizaton detector, or other instrument approved by LDEQ. If the organic vapor analyzer is incapable of detecting the COC due to constituent characteristics (e.g. non-volatiles, metals), alternative field screening tests or other rationale for selection of samples previously approved by LDEQ shall be employed. All samples shall be submitted with completed chain-of-custody forms to an accredited laboratory in accordance with LAC 33:I, Subpart 3.

If warranted by site conditions, each sample may be screened using a standard dust and methane filter. These two types of filters are used in conjunction to differentiate between actual organic vapors and naturally occurring methane gas produced by the decomposition of organic matter in soil. By subtracting the methane filtered reading from the standard filtered reading, a corrected reading of volatile organic content may be obtained.

Source areas, as well as areas of constituent migration, shall be sampled. All sample collection methods, containers, preservation and analyses shall be conducted in accordance with the latest approved edition of the EPA SW-846, *Test Methods for Evaluating Solid Waste* and other pertinent EPA publications and methods unless otherwise specified by LDEQ. If the COC is suspected to be present in the following media, each shall be sampled:

(1) Surface soil (0 - 15 feet bgs)
(2) Subsurface soil (15 feet bgs - depth of impact)
(3) Groundwater
(4) Surface water
(5) Sediment
(6) Biota

For each soil zone (i.e., surface soil and subsurface soil) suspected of being impacted, the soil sample indicating the highest organic vapor measurement or the soil sample chosen based on alternative screening rationale shall be retained for laboratory analyses. It is not necessary to retain a soil sample for laboratory analysis for any particular zone where the samples within that respective zone do not exceed background, as established on an area of the site unaffected by the potential COC. However, at a minimum a soil sample from each boring shall be collected from the:

(1) Soil interval with the highest organic vapor measurement (greater than background or highest indication of COC presence using previously approved alternative screening methods) (surface soil or subsurface soil)
(2) Soil-groundwater interface (for light non-aqueous phase liquids)
(3) Total depth of the boring

If water is not encountered and all samples register background on the field screening instrument or provide no indication of impact using previously approved screening methods, the interval most likely to be impacted shall be retained for laboratory analysis along with the soil sample from the total depth of the boring. The interval most likely to be impacted shall include soils in the 0-3 ft bgs interval if that interval is expected to be impacted based on the release mechanism and site conditions.

Soil samples shall be collected and analyzed as discrete samples and shall not be combined to produce composite samples unless approved by LDEQ.

Further evaluation shall be warranted if:

(1) Analytical results indicate that the vertical and horizontal extent of the impact has not been delineated;
(2) A constituent concentration above the limiting standard for the Option being implemented is expected to impact receptors or media that were not evaluated in the conceptual site model; or
(3) It has not been demonstrated that COC concentrations decrease to acceptable levels with distance (horizontally and vertically) from the sampling location of interest.

It is required that a soil sample be collected to determine the fractional organic carbon (f_{oc}) content of the soil. The fractional organic carbon soil sample shall be collected from a non-impacted area that is representative of the impacted soil conditions at the AOI.

The site investigation data shall meet the data requirements presented in RECAP, Sections 2.4 and shall be evaluated as per RECAP, Section 2.5.

B2.5.3 Soil Characteristics/Geotechnical Analysis

Unless otherwise specified by the LDEQ, soil characteristic/geotechnical samples shall be collected from each impacted lithologic unit to assist in the analysis of environmental fate and transport. If possible, soil samples shall be collected in accordance with ASTM Method D1587 using thin-walled samplers (e.g., Shelby tubes) or other undisturbed sampling tools approved by LDEQ. Soil characteristics/geotechnical analysis that shall be required include, but may not be limited to:

(1) Organic matter (ASTM D2974 or other upon LDEQ approval)
(2) Unified Soil Classification System (ASTM D2487)
(3) Atterberg Limits (LL, PL, PI) (ASTM D4318)
(4) Particle Size Analysis (ASTM D422)
(5) Hydraulic Conductivity[1] (Constant Head) (Granular soils) (ASTM D2434)
(6) Hydraulic Conductivity[1] (Falling Head) (Fine grained soils) (ASTM D5084)

Additional parameters that may be necessary include:

(1) Soil pH (ASTM D4972)
(2) Dry density (Calculated)
(3) Moisture content (ASTM D2216)
(4) Specific Gravity (ASTM D854)
(5) Total Porosity (Calculated)

[1] Not required if conducting an aquifer test

B2.5.4 Groundwater Sampling from Boreholes and Monitoring Wells

Groundwater samples collected from boreholes shall be collected using discrete samplers or through temporarily installed factory slotted casing. If suspended solids could adversely affect sample analytical results, provisions shall be taken to ensure sample quality. A minimum of three well volumes (or until dry) shall be purged from each temporary well prior to sampling or a micropurging technique approved by LDEQ for this site shall be used. The groundwater samples collected from each temporary well or boring shall be obtained from an appropriate depth consistent with the impacted zone. Precautions shall be taken to prevent the zone that is sampled from being impacted by other strata.

Groundwater samples that are collected from borings may appear to be turbid. The turbid samples may exhibit concentrations that are not representative of the groundwater zone that is sampled, particularly in the case of inorganic constituents where sample acidification may leach inorganic constituents from suspended solids. For this reason, the LDEQ recommends that turbid samples be analyzed for both dissolved and total metals if metals are considered as a COC. When sampling for total or dissolved metals, the appropriate analytical method criteria for sample collection and preservation shall be followed.

For monitoring wells, the depth to groundwater and total depth of the wells shall be measured prior to purging. All wells shall be sampled within twenty-four hours of purging. Measurement levels shall be determined relative to the most recent National Geodetic Vertical Datum (NGVD). A minimum of three well volumes (or until dry) shall be purged from each well prior to sampling or a micropurging technique approved by LDEQ shall be used. Replicate measurements shall be taken of the three primary field parameters (pH, specific conductivity, and temperature) at each well. The purpose of obtaining replicate samples is to determine if the groundwater entering the well has stabilized from purging and that the sample to be collected for laboratory analysis is representative of the water in the zone being monitored. Groundwater samples collected from a monitoring well shall be analyzed for total constituent concentration.

If a non-aqueous phase liquid of **known composition** is encountered, the layer thickness shall be measured and reported within the investigation report. If a non-aqueous phase liquid of **unknown composition** is encountered, the layer thickness shall be measured and then sampled and analyzed to assist in the identification of the release source.

For boreholes and monitoring wells that do not exhibit the presence of a non-aqueous phase liquid, water samples shall be collected and analyzed using a method appropriate to detect the suspected COC. Sampling protocol, including equipment decontamination procedures, shall be conducted in accordance with the TS&A Plan. Documentation shall be provided in the investigation report demonstrating that approved QA/QC procedures were employed for both sample collection and analytical procedures.

Groundwater samples collected for the analysis of **volatile organic** compounds shall not be collected with a pump that causes aeration of the sample and care shall be taken not to agitate the samples. Groundwater samples shall not be combined to produce composite samples. Additional guidance on sample collection can be found in USEPA's *RCRA Sampling Procedures Handbook* and USEPA's *RCRA Groundwater Monitoring Technical Enforcement Guidance Document*. Specific sampling parameters may be required by regulation, permit, or to meet the requirements for a RECAP evaluation.

Water samples shall be collected in a progression from borings or monitoring wells where COC are least likely to be present, or expected to be present at low concentrations, to areas where the highest concentrations are expected to be present. The sampler shall use clean latex or nitrile gloves at each sample location and between each sampling interval. It is recommended that clean plastic sheeting shall be used at each sample location to ensure that sampling equipment and sample containers are not inadvertently contaminated. If dedicated equipment is not used, the equipment shall be thoroughly decontaminated between sample locations.

Immediately upon collection, the water sample shall be labeled and preserved using the appropriate handling and preservation protocol. At a minimum, sample labels shall include sample number, date, time, sample location, sampler's name, sample type, analysis to be performed, preservatives used and any other pertinent information that may be useful to ensure proper sample identification. Samples requiring refrigeration must be stored in an ice chest or suitable alternative capable of maintaining a temperature no greater than 4 degrees Centigrade until samples are prepared for analysis by an accredited laboratory. The samples shall always be accompanied with completed chain-of-custody forms.

For routine sampling events, it is required that field QA/QC samples be collected and analyzed. Refer to Section 2.4 of the RECAP document for further guidance on the QA/QC requirements for the RECAP.

All sample collection methods, containers, preservation and analyses shall be conducted in accordance with the latest approved edition of the EPA SW-846, *Test Methods for Evaluating Solid Waste* and other pertinent EPA publications and methods unless otherwise specified by LDEQ. If the acid preservative causes effervescence in a groundwater volatile organic sample, then the sample shall be collected without an acid preservative and kept refrigerated at 4 degrees Centigrade from the time of collection until analysis **within seven days**. Proposed laboratory methods shall be specified in the Workplan and shall be consistent with the suspected COC for the site. Sample quantitation limits shall be consistent with those listed in SW-846 unless samples collected are expected to contain high levels of contaminants, or SW-846 sample quantitation limits exceed Maximum Contaminant Levels for drinking water or any risk-based corrective action level that may be applicable. Should samples be analyzed using a quantitation limit higher than that listed in SW-846, the Maximum Contaminant Level for drinking water or any applicable risk-based corrective action level and results are reported as non-detect, additional sample collection and analysis may be required. All data submitted shall be generated by an accredited laboratory in accordance with LAC 33: I, Subpart 3. The laboratory shall be accredited in those parameters for the applicable test categories.

B2.5.5 Groundwater Monitoring Wells

Well installation and construction shall follow the guidelines established in the latest versions of the LDEQ and LDOTD *Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook* and the LDOTD *Water Well Rules, Regulations, and Standards*. Monitoring wells shall be located so that the contaminant plume, as well as upgradient and downgradient groundwater conditions can be adequately monitored. Wells shall also be installed in areas where immiscible (non-aqueous phase liquid) COC are encountered but shall not be advanced beyond the impacted zone.

Soil borings which will be converted to monitoring wells shall be advanced with hollow stem augers or other methods as approved by LDEQ. Drilling and well development/sampling techniques shall be performed in such fashion to ensure that contamination is not introduced into the borehole/monitoring well and that contamination is not carried from one water bearing stratum to another. Any boring capable of providing a conduit to a deeper zone shall be properly cased to prevent vertical migration of COC. Specific procedures for borehole advancement, monitoring well installation, monitoring well development, and borehole plugging shall be included within the investigation report. Boring logs and monitor well construction diagrams shall be completed and also included within the investigation report.

Well construction material shall be compatible with contaminants and contaminant levels expected to be present. Wells shall not be constructed of dissimilar metals due to the possibility of accelerated corrosion. Well screens shall not exceed ten feet in length unless otherwise approved by the LDEQ. Site-specific conditions may necessitate deviation from proposed depths and screened intervals. Wells shall be screened across the seasonal phreatic zone if light non-aqueous phase liquids are expected to be present, or at the base of the permeable zone if dense non-aqueous phase liquids are expected to be present. Collection of a soil sample for particle size analysis is recommended from all permeable zones in which the wells are screened to assist in determining the proper filter pack and screen slot size. Well development shall be continued until turbidity, pH, specific conductance and temperature have stabilized.

B2.5.6 Aquifer Hydraulic Characteristics/Properties

Unless previously completed, an evaluation of the hydrologic characteristics of the first or subsequent saturated zone shall be performed unless:

(1) Evidence exists that the impact has not migrated to groundwater; and
(2) It is assumed that the first saturated zone meets the definition of Groundwater Classification 1 for the identification and application of the soil concentration protective of the groundwater RECAP standard.

In order to determine the site-specific hydraulic properties of an aquifer and unless otherwise specified or approved by the Department, a slug test shall be conducted on an adequate number of monitoring wells that do not contain non-aqueous phase liquids. For wells that are partially penetrating, the withdrawal slug test is recommended to overcome the affects of the filter pack. For fully penetrating wells where the well screen remains completely saturated, either the injection or withdrawal slug test is appropriate. In some cases, a pumping test may be required by the LDEQ to more adequately define the groundwater regime at the site. For guidance on conducting aquifer tests, refer to RECAP Appendix F.

In order to evaluate an AOC or an AOI under RECAP, groundwater shall be classified into Groundwater Classifications 1, 2, or 3 as determined by current or potential use, maximum sustainable well yield, and total dissolved solids concentration (refer to Section 2.10 of the RECAP document). The information required to classify the groundwater zone(s) of concern at the AOI shall be collected during the site investigation. The current use of an aquifer shall be determined by identifying all existing water wells and usage within one-mile radius of the AOI property boundaries (at a minimum, a LDOTD well survey obtained within the past 12 months and a 500-foot radius walking receptor survey shall be performed). Maximum sustainable well yield shall be determined by well yield estimation methods or by direct measurements as outlined in RECAP, Appendix F. EPA Method 160.1 shall be used to determine the background total dissolved solids concentration of groundwater collected from the aquifer of concern.

B2.5.7 Plugging and Abandonment of Monitoring Wells/Boreholes

All plugging and abandonment activities of monitoring wells or boreholes shall be conducted in accordance with the latest version of the LDEQ and LDOTD *Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook* and the LDOTD *Water Well Rules, Regulations, and Standards.*

B2.5.8 Sediment Sampling

It is advisable that LDEQ approval be obtained prior to conducting any sediment sampling activities. Prior to commencing field operations, thought shall be given to the Data Quality Objectives of the project. Pertinent considerations include the type(s) of sediment samples that will be required and how they will be analyzed. The primary goal of sediment sampling is to collect a sample that accurately represents the sediment condition *in situ.* Specific collection and preservation requirements shall depend on site-specific conditions. For example, benthic community analyses require different sediment collection and preservation methods than those for chemical analyses. The technique chosen will depend on several considerations, including the numbers and types of analyses required, the type(s) of sediment being collected, and the depth to which sediment is to be sampled.

B2.5.9 Surface Water Sampling

It is advisable that LDEQ approval be obtained prior to conducting surface water sampling activities. Surface water is generally characterized by one of four types of environments:

(1) Rivers, streams, bayous, and creeks;
(2) Lakes and ponds;
(3) Impoundments and lagoons; and
(4) Estuaries.

Sediments are often sampled in conjunction with surface water, and are considered an integral part of the surface water environment since each type of surface water is in contact with sediments. Because surface waters can exhibit a wide range of general characteristics, such as size or flow, the collection technique shall be adapted to site-specific conditions.

Surface water sampling locations will vary with the size of the water body, flow regime, and the amount of mixing (turbulence). Best professional judgment shall be utilized to evaluate whether changes in sampling locations are reasonable and consistent with the objectives of the sampling and analysis activities.

B2.5.10 Biota Sampling

It is advisable that LDEQ approval be obtained prior to conducting biota sampling activities. Biota sampling shall be conducted when exposure pathways involving biota are determined to be complete, or potentially complete, for the AOI or areas adjacent to the AOI. The sampling and analysis of biota shall be conducted in accordance with current EPA risk assessment guidelines.

B2.5.11 Groundwater Monitoring

In general, unless otherwise approved by the Department, beginning the first quarter after the investigation is completed, quarterly monitoring of all groundwater monitoring wells (if installed) shall be implemented at sites where COC have been detected until this requirement is modified or terminated by the Department. Where NAPL is present, wells containing NAPL should be gauged but not sampled unless specifically directed to do so by the Department in order to identify a source of release or constituent of concern.

Quarterly gauging and sampling results shall be reported to the Department in triplicate on a semi-annual basis, due within thirty days after the end of each semi-annual period unless otherwise specified or approved by the Department. Quarterly periods include January 1 through March 31, April 1 through June 30, July 1 through September 30, and October 1 through December 31. Department Team Leaders must be notified five days in advance of monitoring events and the events must be separated by a sixty-day intervening period unless otherwise approved by the LDEQ.

For underground storage tank sites with treatment units or utilizing passive remediation that are eligible for Louisiana Motor Fuels Underground Storage Tank Trust Fund reimbursement, the sampling frequency shall be modified to annually in any well that has exhibited COC concentrations below the Departmentally approved remediation standard for four consecutive quarters unless otherwise directed by the Department.

Results of quarterly monitoring must be reported **semi-annually** using the format specified in Section B4.0 unless another reporting frequency or format is stipulated by regulation or approved by the LDEQ. The required format includes a title page, a summary of the monitoring events, any recommendations for future monitoring, a summary of remediation system operations (as applicable), figures, tables, signed certification that appropriate sampling protocols were followed, full laboratory reports with completed chain-of-custody, laboratory QA/QC reports, and field data sheets for all sampling events during the reporting period, and documentation of the disposition of purge water.

The monitoring summary shall describe the activities associated with each of the monitoring events during the semi-annual period. Recommendations should be provided regarding current and future monitoring. If a remediation system is present, the report must include: a summary of remediation system operations; run-time percentages; reasons for non-operational days; identification of wells in use for treatment and/or recovery; gallons of NAPL/water recovered; system monitoring results, including but not limited to operation and maintenance logs, discharge monitoring report summaries and excursions, and air monitoring results (if applicable); a pre-remediation contaminant distribution map; an evaluation of system efficiency, including a comparison of the projected and actual rate of contaminant reduction; a discussion of the progress made toward meeting the remediation standard, including the percent reduction of each COC in relation to its remediation standard; and any recommendations for system modification to improve efficiency.

For sites with remediation systems that are recovering impacted groundwater or vapor, the LDEQ may require periodic sampling of the groundwater and/or vapor influent for analysis and quantification of contaminant mass removed. If so directed, mass removal rates shall be included in the semi-annual reports in the discussion of system efficiency.

Required figures include a scaled site plan (use of 11” X 17” maps are encouraged), a potentiometric map for each zone monitored in the gauging event using the scaled site plan, and isoconcentration map for each COC which exceeds remediation standards for each zone monitored in the sampling event. Required tables include Forms 2, 4, 5, and 6 present in RECAP Appendix C, as well as a Historical Groundwater Monitoring Summary Form (see Section 4.2). The historical table shall include at least the eight previous monitoring events. If NAPL is detected, the NAPL thickness should be reported in the comments section of forms 4, 6, and in the appropriate column on the Historical Groundwater Monitoring Summary Form. Groundwater elevation should be adjusted where NAPL is encountered and the adjusted elevation used on potentiometric maps.

Signed and dated certification must be provided in each report stating that all applicable QA/QC procedures were followed for each monitoring event and that all laboratory analyses have been performed by laboratories accredited by the State of Louisiana in accordance with LAC 33:I, Subpart 3. Full laboratory reports and QA/QC certification must be included for each COC for each sampling event. Copies of all completed chain-of-custody documents and field data sheets must be provided for each monitoring event during the reporting period, as well as documentation of the disposition of purge water.

B2.5.12 Air Sampling

Air sampling should be considered for the evaluation of the vapor intrusion pathway when all other methods (application of the $Soil_{es}$ and/or GW_{es} RS, soil gas assessment, etc.) have been implemented or determined to not be feasible based on site-specific conditions. Prior to performing air sampling to demonstrate under RECAP that the air pathway is not being impacted, a workplan should be submitted to the Department.

The principal objective of air sampling is to obtain an upper-bound representation of baseline conditions that provide a conservative indication of exposure and health risk. To obtain such a worst-case estimate, baseline samples must be collected under conditions expected to give rise to maximum air concentrations. Such conditions may include periods of high groundwater levels or, for enclosed structures, soil vapor intrusion in winter when use of a heating system creates a chimney effect, drawing vapors into the structure.

Many variables can influence air sampling results. For ambient air sampling, this could include meteorological and hydrogeological conditions. For indoor air sampling, this could include the air exchange rate for the home, operation of a building HVAC system, hydrologic and meteorological conditions, and household activities including chemical use. These variables combine to create site-specific and temporal exposure conditions that must be considered in evaluating constituents of concern.

Instantaneous indoor air sample collection protocol:

(a) Place samplers at breathing zone height to collect a representative sample of COC concentration in indoor air.

(b) Perform sampling in a room that is used regularly, such as a living room, den, or playroom.

(c) Avoid bedrooms, kitchens, and laundry rooms where use of personal products and other chemical products may interfere with sampling.

(d) Perform “living area” sampling at lowest level of the house suitable for occupancy.

(e) Close windows and outside doors and keep them closed as much as possible during sampling except for normal entry and exiting.

(f) Place samplers approximately 1 meter above the floor away from drafts (e.g., vents, open doors and windows, air conditioners, fans), high heat (heaters and heat vents), high humidity, exterior walls, and other obstructions to air flow.

(g) Samplers should be placed on wooden stands or a piece of furniture in the central part of the room.

(h) All sampling equipment should be placed away from family traffic patterns and out of reach of pets and children.

(i) Do not operate fans or other ventilation equipment.

(j) Only operate air conditioning units that recirculate interior air.

(k) Samplers should not be placed close to attached garages, ash trays, or other possible sources that may bias sampling results.

(l) Using the attached questionnaire, document household conditions and activities during the sampling period including characteristics, resident activities, and potential ambient sources that may influence indoor air sampling results.

(m) Provide a diagram of sampling locations.

Quality Assurance/Quality Control protocol:

(a) Refer to RECAP Section 2.4.
(b) Follow the EPA Method.
(c) Field blanks and duplicate samples shall be collected for a minimum of 5% of the samples collected.
(d) Air samples collected using sample bags shall not be shipped by air unless the cargo cabin is pressurized.
(e) The general weather conditions during sampling shall be recorded including ambient temperature.

Sampling Methods:

Prior to implementation of an air sampling event, a background air sample shall be collected for the subject site as near the time of the air sample collection as possible. The background sample shall be collected upwind of the AOI or structure under evaluation and shall be in an area unaffected by the source COC. It is recommended that an additional background sample be collected downwind of the AOI or structure, which can provide additional information to aid in evaluating the air exposure concern. For an enclosed structure, it may also be necessary to obtain a background air sample from a structure with a similar use and occupancy that has no potential to be affected by the source COC.

Concurrent with the air sampling event, the ambient air within the AOI and all rooms of an enclosed structure and any enclosed spaces (closets, cabinets) shall be screened with an OVA, TVA, and/or other appropriate volatile organic monitoring device in accordance with the manufacturer's specifications. In the case that the monitoring instrument detects a concentration level of greater than 2 ppm above background within a defined area of the AOI or enclosed structure, then the Summa canister air sample shall be collected in the center of the enclosed structure.

If the analyzer does not detect a concentration greater than 2 ppm above background within the building, then the Summa canister air sample will be collected in the center of the enclosed structure.

The analyst will maintain a logbook of all recordings. The analyst shall complete a Canister Sampling Field Data Sheet for each sample. The data sheet shall serve as the chain of custody document. In addition to writing the time and location of each canister sample on the data sheet, the analyst shall indicate the sample location on a schematic drawing. The analyst shall take a photo of each sample location. Photos will be part of the documentation package. If a canister sample is collected due to an elevated analyzer reading, that reading will be included on the Canister Sampling Field Data Sheet along with any other pertinent observations (note the presence of items such as ash trays, household cleaning supplies, and insecticides). Traffic conditions at the sampling locations should be noted on the data sheet for ambient air samples.

During a sampling event of an enclosed structure, doors and windows should be kept closed as much as possible, except to allow authorized personnel access to perform duties necessary to collect the air samples.

Analytical Methods:

Samples shall be analyzed using EPA Reference Method TO-15 or TO-17 using a gas chromatograph with flame ionization detection and a gas chromatograph with mass selective detector. All method performance criteria will be met. Laboratory analysts will follow procedures in the LSD SOP *HP GC/MS Determination of Ozone Precursor Compounds and Target Compounds Based on EPA Method TO-15 Collected in Summa Canisters*. Any other analytical procedure shall be justified in the work plan and shall receive approval from the Department prior to sampling.

References:

EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002.

EPA User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings, June 2003.

B3.0 SITE INVESTIGATION SUBMITTAL REQUIREMENTS

Unless otherwise approved, at a minimum, the site investigation report shall:

(1) Document the person(s) involved with the project;

(2) Incorporate certification, signed by the project manager, verifying compliance with the Remediation Investigation Workplan, QA/QC Plan, TS&A Plan and H&S Plan;

(3) Include a description of any unusual events that occurred or conditions encountered during the investigation;

(4) Describe the method(s) of investigation with the rationale for the method(s) and an explanation detailing how the investigation met the assessment goal;

(5) Clearly state conclusions regarding all sources (on-site and off-site) for any impacted media encountered within the study area;

(6) Identify all landowners, lessees, and servitude holders where COC are confirmed or projected to be present above RECAP SS;

(7) Include groundwater gauging results (if collected) graphically in the form of a potentiometric surface map;

(8) Tabulate and graphically present in isopleth format the soil concentrations of COC encountered;

(9) Provide a separate isopleth map for each impacted soil zone (surface soil and subsurface soil - contours shall be extrapolated to show the estimated concentration between soil borings, but shall not be projected beyond boring locations for which data are available);

(10) Tabulate and graphically present in isopleth format the groundwater concentrations of COC encountered (contours shall be extrapolated to show the estimated extent of the impacted groundwater between monitoring points, but shall not be projected beyond locations for which data are available);

(11) Tabulate and graphically present in isopleth format the apparent measured thickness of any immiscible layers (non-aqueous phase liquids) obtained from boreholes or monitoring wells (if detected);

(12) Include the calculations, results, and conclusions of the estimated flow velocity, quality, and classification of the groundwater (if determined);

(13) Include the calculations, results and conclusions of all aquifer tests (if provided);

(14) Discuss the disposition of the cuttings, water, and wastes generated during the investigation;

(15) Include a geologic fence diagram or cross section of the study area;

(16) Determine the location of all underground utility lines, list their material of construction (if known), and present their location(s) graphically on a site map;

(17) Include the results of a water well survey (both in the text and graphically) provided within a one-mile radius of the AOI property boundaries (at a minimum, an LDOTD water well survey obtained within the past 12 months and a 500-foot radius walking receptor survey shall be performed);

(18) Propose interim remedial action if non-aqueous phase liquids or imminent threats to sensitive receptors are discovered during the course of the investigation (any unknown non-aqueous phase liquid detected shall be characterized);

(19) Submit RECAP Form 1 Submittal Summary Form (Appendix C) completed through question 35;

(20) Complete and include a RECAP evaluation (risk analysis of the investigation results in accordance with RECAP shall be provided unless COC concentrations do not exceed RECAP screening standards or this requirement is waived by LDEQ; **for Louisiana Motor Fuels UST Trust Fund sites, details of the RECAP evaluation, including the management option to be applied and input parameters with justification, shall be provided to LDEQ for approval prior to the initiation of the evaluation**); and

(21) Provide recommendations regarding the need for corrective action based upon the results of the RECAP evaluation.

Note: All maps shall have a bar scale, legend, north arrow, contour intervals (if contoured), date data was obtained, and map date. All maps, figures, diagrams and cross sections submitted shall be legible and unless otherwise approved by the Department, not larger than 11 inches by 17 inches and shall be folded to a standard report format (8.5 inches by 11 inches).

All site investigation information shall be reported in the following format:

B3.1 Title Page

SITE INVESTIGATION REPORT
NAME OF INVESTIGATION LOCATION
STREET ADDRESS
CITY AND STATE
PARISH
LDEQ AI# (if assigned)
FID # (UST SITES)
INCIDENT # (UST SITES)
COMPLIANCE ORDER # (if applicable)

SUBMITTER
CONTACT PERSON
MAILING ADDRESS
AREA CODE AND PHONE #

CONSULTANT
CONTACT PERSON
MAILING ADDRESS
AREA CODE AND PHONE #

SIGNATURE OF PREPARER
TYPED NAME OF PREPARER AND TITLE
DATE OF REPORT

B3.2 Executive Summary

(Brief, concise bullets; double space between items)

(1) AOI history
(2) Reason for investigation

(3) Site characteristics
(4) Site status (active/inactive)
(5) Release source(s)
(6) Soil type
(7) Highest concentrations in all impacted media
(8) Free product conditions
(9) Potential and/or affected receptors
(10) Problem evaluation

B3.3 Table Of Contents

B3.4 Site History

(1) Previous land use
(2) Current use
(3) For storage vessels (underground or aboveground) or pipelines:
   (a) Age and history of storage vessel or pipeline (list any prior releases)
   (b) Number of storage vessels and material of construction
   (c) Substance stored or transported
   (d) System type (pressure, suction, or gravity, if applicable)

(e) Current status
(f) Adjacent site uses
(g) Any other pertinent information
(4) Future land use (if known)
(5) Zoning of site
(6) Description of release
(a) Substance(s) released
(b) Quantity released (if known)
(c) How and when the released occurred
(d) Location of the release on the site
(e) Migration routes of release
(f) Any other pertinent information
(7) Results of the Preliminary Evaluation (if performed)

B3.5 Emergency/Interim Corrective Action

(1) Free product monitoring and recovery
(2) Vapor abatement
(3) Soil excavation and disposal
(4) Disposal of water and free product
(5) Other emergency measures (evacuation, drinking water supply replacement, etc.)

B3.6 Investigation Description

(1) Sample collection and screening rationale
(2) Boring and monitoring well placement or other exploratory method rationale
(3) Geology/hydrology discussion
(a) Regional groundwater characteristics
(b) AOI soil and groundwater characteristics
(c) Aquifer testing
(d) Groundwater classification (GW-1, GW-2, or GW-3)
(e) Any other pertinent information
(4) Constituent(s) of concern distribution
(a) All phases
(b) All media
(5) Off site impact
(6) Off site sources
(7) Unusual conditions or findings

B3.7 Sensitive Receptors

(1) Contaminant migration pathways
(a) Man-made (conduits, utilities, sewers, etc.)

(b) Natural (air, soil, surface/groundwater, etc.)
(2) Biological receptors
(3) Natural receptors (surface water, groundwater, etc.)
(4) Man-made receptors (water wells, buildings, utilities, etc.)

B3.8 Recap Evaluation Results

B3.9 Summary Of Findings

(1) Release source(s)
(2) Soil type
(3) High concentrations (all phases and media)
(4) Free-product conditions (if applicable)
(5) Potential and/or affected receptors
(6) Off-site impact
(7) Off-site sources
(8) Groundwater conditions (if applicable)
(a) Direction and velocity of flow
(b) Quality and yield
(c) Groundwater classification (GW-1, GW-2, or GW-3)
(d) Potential for COC migration via groundwater

B3.10 Recommendations

(1) Recommendations for interim corrective action
(2) Recommendation for corrective action based on RECAP findings

B3.11 Appendices

B3.11.1 Appendix A - Figures (11" x 17" fold out acceptable and encouraged)

(1) Regional topographic map
(2) Regional site map (including adjacent properties)
(3) Sensitive receptor map (1-mile radius and 500-foot walking receptor survey)
(4) Scaled site plan
(a) Release source(s)
(b) Sampling locations
(c) Utilities
(d) Structures
(5) Potentiometric map
(6) Free product thickness map (if applicable)
(7) Isoconcentration maps
(a) Soil (for each impacted interval – surface soil and subsurface soil)

(b) Groundwater
(c) Other media (if applicable)
(8) Fence diagram(s) and/or cross section(s)

B3.11.2 Appendix B – Tables

(1) Well data
(a) Monitoring well number
(b) LDOTD identification number
(c) Well type
(d) Casing material
(e) Casing diameter (inches)
(f) Development method
(g) Top of casing elevation (NGVD)
(h) Ground water elevation at installation
(i) Well depth
(j) Ground surface elevation
(k) Elevation at top of screen
(l) Elevation at bottom of screen
(m) Sump length
(n) Latitude and longitude
(o) Latitude/longitude method
(p) Date completed
(2) Sampling data
(a) Monitoring well identification number
(b) Date sampled
(c) Gallons purged
(d) Purge method
(e) Sampling frequency
(f) Water elevation
(g) Total depth
(h) Free product elevation
(i) Comments
(3) Groundwater analytical summary (see RECAP Appendix C)
(4) Soil analytical summary (see RECAP Appendix C)
Include field data (specify instrument used) and laboratory
(5) Free product recovery data (if applicable)
(a) Product thickness over time
(b) Recovery results per event
(c) Total product recovered

B3.11.3 Appendix C - Boring logs and monitoring well construction diagrams

See LDOTD and LDEQ *Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook* for requirements.

B3.11.4 Appendix D - Aquifer test data with calculations

B3.11.5 Appendix E – RECAP calculations

B3.11.6 Appendix F - Signed certifications of compliance with QA/QC, TS&A and H&S plans

B3.11.7 Appendix G - Lab data sheets and signed chain-of-custody forms

B3.11.8 Appendix H - Reconciled 90-day inventory records (for UST sites)

B3.11.9 Appendix I - Release detection records for one year (for UST sites)

B3.11.10 Appendix J - Tank tightness records (for UST sites)

B3.11.11 Appendix K - Registration forms

(1) Monitoring wells (LDOTD – if applicable)
(2) USTs (if applicable)

B3.11.12 Appendix L – References

B4.0 GROUNDWATER MONITORING SUBMITTAL REQUIREMENTS

Unless otherwise approved, at a minimum, site groundwater monitoring reports shall include the following items:

(1) Title Page (see example)

(2) Summary of each monitoring event, including any unusual conditions encountered

(3) Recommendations for future monitoring events

(4) Summary of remediation system operations (as applicable), including but not limited to: a summary of remediation systems operations during the reporting period; run time percentage; reasons for non-operational days; identification of wells in use for treatment and/or recovery; gallons of NAPL/groundwater recovered; system monitoring results, including operation and monitoring logs, discharge monitoring excursions, and air monitoring results; a pre-remediation contaminant distribution map; and evaluation of system efficiency, including a comparison of the projected and actual rate of contaminant reduction, a discussion of the progress made toward meeting the remediation standards, including the percent reduction of each COC in relation to its remediation standard; and any recommendations for modifications to improve efficiency.

(5) Figures (11” x 17” preferred)
   (a) Scaled site plan
   (b) Potentiometric map for each zone monitoring during each monitoring event
   (c) A pre-remediation contaminant distribution map
   (d) Isoconcentration maps for each COC detected at concentrations exceeding its remediation standard for each monitoring event

(6) Tables
   (a) RECAP Form 5 (Groundwater Monitoring Well Characteristics Report Form)
   (b) RECAP Form 4 (Sampling Information Summary Report Form)
   (c) RECAP Form 6 (Groundwater Monitoring Well Sampling Event Summary Form)
   (d) RECAP Form 3 (Analytical Data Summary Report Form)
   (e) Historical Groundwater Monitoring Summary Form (see example)

(7) Signed and dated certification by the Project Manager that the monitoring events were completed in accordance with appropriate QA/QC
(8) Laboratory analytical and QA/QC reports for each sampling event
(9) Completed chain-of-custody forms for sampling event
(10) Field data sheets for each sampling event
(11) Documentation of the disposition of purge water, including manifests (if applicable)
(12) Any additional information deemed appropriate

B4.1 Title Page

(Example Groundwater Monitoring Report Title Page)

Groundwater Monitoring Report
Monitoring Period (Ex. Jan.-June, 2002)
Name of Agency Interest/Area of Investigation
Street Address
City, State
Parish
Agency Interest Number

Responsible Party
Contact Person
Mailing Address
Area Code and Telephone Number

Consulting Firm
Contact Person
Mailing Address
Area Code and Telephone Number

____
Signature of Preparer
Typed Name and Title of Preparer

Date of Report

B4.2 Example Historical Groundwater Monitoring Summary Form

Monitoring Well Number ___								Monitoring Well Number ___							
Date Sampled	Depth to Groundwater (BGL)	NAPL Thickness (ft.)	Parameter (units)	Parameter (units)	Parameter (units)	Parameter (units)	Parameter (units)	Date Sampled	Depth to Groundwater (BGL)	NAPL Thickness (ft.)	Parameter (units)	Parameter (units)	Parameter (units)	Parameter (units)	Parameter (units)

Monitoring Well Number ___								Monitoring Well Number ___							
Date Sampled	Depth to Groundwater (BGL)	NAPL Thickness (ft.)	Parameter (units)	Parameter (units)	Parameter (units)	Parameter (units)	Parameter (units)	Date Sampled	Depth to Groundwater (BGL)	NAPL Thickness (ft.)	Parameter (units)	Parameter (units)	Parameter (units)	Parameter (units)	Parameter (units)

Monitoring Well Number: The identification commonly used to identify this well in correspondence to the LDEQ.
Date Sampled: The year, month and day the well was sampled. **Example: 010525**
BGL: Below ground level
Parameter (units): Parameter name and the units that the sample results and sample quantitation limit are reported in.
Examples: Benzene (ug/L), TPH as Gasoline (mg/L)

APPENDIX C

RECAP FORMS

RECAP FORMS

RECAP FORM 1
RECAP SUBMITTAL SUMMARY

A completed RECAP Submittal Summary form shall be included as the first page of the RECAP Submittal.

1. Agency Interest Name: ____________________
2. AI#: ____________________
3. Name of Area of Investigation: ____________________
4. Facility Owner Name: ____________________

5. Facility Owner Mailing Address: ____________________
____

6. Facility Operator Name: ____________________

7. Facility Operator Mailing Address: ____________________
____

8. Facility Physical Address: ____________________
____

9. Parish: ____________________

10. Latitude/Longitude of Primary Facility Entrance: ____________________

11. Latitude/Longitude Method: ____________________

12. Facility Contact Person: ____________________

13. Facility Contact Person's Phone Number: ____________________

14. Facility Contact Person's Mailing Address: ____________________
____

15. Facility Contact Person's E-mail Address: ____________________

16. Area of Investigation Location: ____________________

17.Area of Investigation Size: ____________________

18. Horizontal and Vertical Extent of the Area of Investigation has been identified? [ ] Yes [ ] No

19. Describe the Current and Historical Uses of the Property on which the AOI is located and the Time Periods for Each Use/Activity: ____________________
____
____

20. Indicate How Release Occurred (if known): ____________________

21. List Constituents Released (if known): ____________________
____

22. RECAP Submittal Date: ______________________________

23. RECAP Submittal Prepared by: ______________________________

24. RECAP Submittal Preparer's Employer: ______________________________

25. RECAP Submittal Preparer's Phone Number: ______________________________

26. Site Ranking: [ ] Class 1 [ ] Class 2 [ ] Class 3 [ ] Class 4

27. Media Impacted:

[ ] Surface Soil	[ ] Groundwater 1A	[ ] Surface water
[ ] Potential Surface Soil	[ ] Groundwater 1B	[ ] Sediment
[ ] Subsurface Soil	[ ] Groundwater 2A	[ ] Biota
	[ ] Groundwater 2B	
	[ ] Groundwater 2C	
	[ ] Groundwater 3A	
	[ ] Groundwater 3B	
	[ ] Groundwater Classification Unknown	

28. Is soil present at 0-3 ft bgs impacted? [ ] Yes [ ] No

29. Release volume: ______________________________

30. Is NAPL Present? [ ] Yes [ ] No

31. Aquifer: ______________________________

(a) Distance from AOC/AOI to the nearest downgradient property boundary: ______________________

(b) Distance from AOC/AOI to the nearest downgradient surface water body: ______________________

(c) Depth from known contamination to the nearest Groundwater Classification 1 aquifer: ____________

(d) If a GW 1 or 2 aquifer, distance from POC to nearest downgradient drinking water wells: __________

32. Distance from known contamination to nearest enclosed occupied structure: ______________________

33. Depth Groundwater First Encountered: ______________________________

34. Distance from POC to POE: ____________________

35. Dilution Factor Applied: ______________________

36. Fractional Organic Carbon Content: ______________________________

37. Current Land Use: [ ] Non-Industrial [ ] Industrial NAICS: ____________

38. Potential Future Land Use: [ ] Non-Industrial [ ] Industrial NAICS: ____________

39. Is There Offsite Contamination? [ ] Yes [ ] No

(a) If Yes, Land Use Offsite: [ ] Non-Industrial [ ] Industrial NAICS: ______________

(b) If Yes, Identify the Landowner(s), Lessee(s), and/or Servitude Holder(s): ________________________
____

40. Management Option(s)Applied at the AOI: [ ] SO [ ] MO-1 [ ] MO-2 [ ] MO-3

41. Provide documentation that the AOI meets the criteria for the Option implemented: ________________________
____
____
____

42. Current Status of the AOI:

(a) The AOI will be further evaluated under: [ ] MO-1 [ ] MO-2 [ ] MO-3.

(b) Medium for further evaluation: ____

(c) Exceedances:

COC	[ ] AOIC [ ] CC	[ ] LSS [ ] MO-1 LRS [ ] MO-2 LRS

43. [ ] The AOI will be remediated under: [ ] SO [ ] MO-1 [ ] MO-2 [ ] MO-3.

(a) Medium requiring remediation: ____
(b) Corrective Action Standards: [ ] Non-industrial [ ] Industrial
(c) Institutional Controls Are Proposed? [ ] Yes [ ] No [ ] Institutional Controls Already Present
(d) Interim Corrective Actions Have Been Performed? [ ] Yes [ ] No [ ] Not Applicable
(e) If yes, explain.
____
____

44. Exceedances and Corrective Action Standards to be applied:

COC	[ ] AOIC [ ] CC	[ ] LSS [ ] MO-1 LRS [ ] MO-2 LRS [ ] MO-3 LRS [ ] Alternate MO-3 RS

45. All constituent concentrations in all impacted media:

[ ] comply with the applicable RECAP standards; **or**

[ ] have been remediated to the applicable RECAP; **or**

[ ] alternate remediation standards and a NFA-ATT determination is being requested **and**:

(a) RECAP Standards Applied: [ ] Non-industrial [ ] Industrial
(b) There are institutional controls on this property: [ ] Yes [ ] No
(c) If yes, type of institutional control employed: ____________________
(d) If applicable, the conveyance notice has been filed with the ______________ (parish) Clerk of Court noting that the AOI was closed under industrial standards.

46. RECAP Standards Applied at the AOI:

Medium: ______________________________

COC	**[ ] AOIC** **[ ] CC**	**[ ] LSS** **[ ] MO-1 LRS** **[ ] MO-2 LRS** **[ ] MO-3 LRS** **[ ] Alternate Standards**

47. Provide documentation that the AOIC and/or CC will continue to comply with the applicable standard:
____
____
____

48. If groundwater was impacted, provide a description of aquifer use and list the locations and depths of the nearest drinking water supply wells:______________________________
____

49.Provide: (a) a description of the remedial actions implemented; (b) verification that the source has been removed/mitigated and that residual constituent concentrations comply with the LSS or LRS; and (c) a discussion on the offsite disposal of investigation and remediation wastes including types, quantities, disposal location, etc.
____
____
____

50. If applicable, discuss monitoring well plugging and abandonment: ______________________________

51. Is There a Current or Potential Ecological Impact? [ ] Yes [ ] No

RECAP FORM 2
ANALYTICAL DATA SUMMARY

DATE: ______________________________ **PAGE** ___ **of**

SITE NAME:

SITE PHYSICAL ADDRESS:

MEDIA SAMPLED:

Line #	COC/CAS	Method	Location and Depth	Sample Identification	Sample Date	Option Used	Limiting Standard	PQL	Sample Result	QA/QC Flag

RECAP FORM 2
ANALYTICAL DATA SUMMARY
Definitions

COC/CAS: *The potential or actual constituent of concern analyzed, and its defining Chemical Abstract service number.* ***EXAMPLE: Butyl benzyl pthlate/ 85-68-7***

DATE: *Date of completion of this report (yy,mm,dd).* ***EXAMPLE: 970131***.

LOCATION & DEPTH: *The unique identification assigned by the site to the location where the sample was collected, and the approximate depth of collection in feet.* ***EXAMPLE: B-1 (12ft)***

LIMITING STANDARD: *The lowest RECAP Standard (RS) or Screening Standard (SS) of all standards applicable to the given COC or source medium.* ***All results are to be reported in Parts per Million (PPM) such as mg/kg or mg/L***.

LINE # :*Assigned per unit of reported information. Used to ease reference in finding information and identifying possible QA/QC Flags.*

MEDIA SAMPLED: *The environmental medium that was sampled.* ***EXAMPLE: SOIL, WATER, AIR***

METHOD*: The analytical method(s) used to prepare and quantify a COC.* ***EXAMPLE: SW-846-8260. Note: Any alternate method outside of EPA or published RECAP methods must be pre-approved by the Department.***

OPTION USED: *Management option used to determine the limiting standard.* ***EXAMPLE: SO, MO-1, MO-2, or MO-3.***

PAGE __ of __: *Page sequence of report.* ***EXAMPLE: PAGE 1 OF 2.***

PQL: *The practical Quantitation Limit used****. All results are to be reported in Parts per Million (PPM) such as mg/kg or mg/L***.

QA/QC Flag: *Any factor associated with the sample analysis that may cause results to be rejected unless properly explained.* ***See additional instruction section.***

SAMPLE DATE: *The date that the sample was collected (yy,mm,dd).* ***EXAMPLE: 970101.***

SAMPLE IDENTIFICATION NO.: *The unique identification number that was used to identify this sample at the time of collection.* ***EXAMPLE: 970101-A. NOTE: Analytical (Laboratory) Sample IDs and Collection IDs are to be IDENTICAL.***

SAMPLE QUANTITATION LIMIT: *The lowest level at which the constituent could accurately and reproducibly be quantitated during the analysis of this sample.* ***EXAMPLE: 0.005. All results are to be reported in Parts per Million (PPM) such as mg/kg or mg/L***.

SAMPLE RESULT: *The concentration of a constituent in the sample as determined by the laboratory.* ***If a constituent was not detected this value should be reported as less than the sample quantitation limit****. EXAMPLE: < .005****. All results are to be reported in Parts per Million (PPM) such as mg/kg or mg/L****.*

SITE NAME: *The name by which the site is referred to in correspondence to the LDEQ.* ***EXAMPLE: RBCA Corporation, Baton Rouge Terminal.***

SITE PHYSICAL ADDRESS: *The physical address of the site that has been sampled.* ***EXAMPLE: 7290 BLUEBONNET BLVD, BATON ROUGE LA 70809.***

<u>**ADDITIONAL INSTRUCTIONS:**</u>

1. The QA/QC Flag box should be marked (with an X or appropriate qualifier) ***only if there is a QA/QC Flag***. Each Flag should be listed by Line number with a brief explanation of the QA/QC discrepancy provided at the end of the form. **EXAMPLE:**

    Line # 5: The sample duplicate was out of range by 5 percent most likely due to error from dilution necessitated by the high presence of sought analyte in the samples.

    Line #6 and Line #8: While the field blank was found to exceed the limiting standard, both samples were found to be below the MO-1 standards, and all other field and instrument verification QA/QC passed.

2. It is not necessary to report information within a cell that would be a duplicate of facts given in a cell directly above. **EXAMPLE: If Line # 1, 2, 3, 4, and 5 were all associated with the same sample location and depth, it is only necessary to list the location and depth in the appropriately provided space in Line # 1.**

RECAP FORM 3
ANALYTICAL DATA EVALUATION

Date____

Facility Name ____

Agency Interest (AI #) ____

Physical Site Location ____

Operation Address ____

Owner/Responsible Party Address____

1. Data Generation

1.A All sample collection was done in accordance to applicable RECAP collection guidelines. [ ] Yes [ ] No

1.B All generated data was obtained using EPA Methodology, RECAP approved methodology (as found in text), or methodology pre-approved by the Department. Any modifications to methodology have been noted, explained and pre-approved by the Department. [ ] Yes [ ] No

1.C All Data are analyte-specific and the identity and concentration are confirmed.
[ ] Yes [ ] No

1.D All data were generated by a LDEQ certified laboratory. [ ] Yes [ ] No

2. Data Evaluation and Usability

2.A Methods used are appropriate for analyzed constituents:

1. Analysis used is specific for COCs. [ ] Yes [ ] No

2. Results are produced with the most appropriate sensitive method. (e.g. not using portable field analytical instruments). [ ] Yes [ ] No

2.B Sample Quantitation Limits (SQL)

Note: The SQL is not synonymous with the IDL (instrument detection limit) or the MDL (minimum detection limit). The SQL is derived after considering the effects

of dilutions, loss of instrument sensitivity, matrix interferences, and other interferences effecting the lower-end accuracy of analysis, and therefore resulting in the elevation of the method detection limit. The SQL will be the only detection limit considered for comparison to limiting standards.

1. All SQLs are less than reference concentrations (RS or SS). [ ] Yes [ ] No (If yes, proceed to Section 2C, Qualifiers and Codes).

2. Samples with SQLs greater than the limiting standard are not being reported as non-detected. (If yes, proceed to Item # 3 of this section). [ ] Yes [ ] No

   If the SQL is higher than the limiting standard, and a non-detect is being reported, data may still be considered by the Department if all the below conditions are met:

   (a) The non-detect results make up less than 5-10 percent of a sample set for a considered individual COC.

   (b) The ND is not classified as being from a key sampling location (e.g. drinking water well).

   (c) Documentation provided by a LDEQ accredited laboratory (with supporting evidence) is included in the document demonstrating that a practical quantitation limit was not achievable due to site or sample-specific conditions.

   Have the above three conditions been met? [ ] Yes [ ] No

   Note: If one or more of the above conditions cannot be met, the total (100%) value of the PQL may be reported as a positive detected result.

   Will this option be used and annotated in the Report? [ ] Yes [ ] No

   Note: If all answers in this item are "no," analytical results will be rejected and re-sampling will be required.

3. Are sample results higher than both the PQL and the limiting standard? [ ] Yes [ ] No (If so, results may be used despite elevated PQL).

2.C Qualifiers and Codes

1. All qualifiers and codes for flagged data have been noted on form 3 and supporting documentation has been included in the laboratory information package. [ ] Yes [ ] No

2. All data with a qualifier of "R" (unusable data) do not come from critical sample points (if so, resample will be required). [ ] Yes [ ] No

3. All data with a qualifier of "J" (estimated concentrations) have been included as positive results. [ ] Yes [ ] No

2.D Blank Samples

1. Field and laboratory blanks showed no signs of contamination, and no constituents were detected in blanks. (If no constituents or contaminants were detected, proceed to 2E, Tentatively Identified Compounds). [ ] Yes [ ] No

2. Contaminants or constituents found in blanks can be considered common laboratory contaminants as defined by EPA (acetone, 2-butanone, methylene chloride, toluene, or phthalates); and the same contaminants found in site samples are present at quantities less than 10 times the levels found in blanks. (If no, constituents are to be reported as detected COCs). [ ] Yes [ ] No

3. Contaminants or constituents found in blanks are not considered common laboratory contaminants as defined by EPA; and the same contaminants found in site samples are present at quantities less than 5 times the levels found in blanks (If no, constituents are to be reported as detected COCs). [ ] Yes [ ] No

2.E Tentatively Identified Compounds (TIC)

All possible TIC have been identified, evaluation is supported with documentation in the text, and information conforms to the requirements as listed in Section 2.5 of the RECAP. [ ] Yes [ ] No

2.F Historical Data

1. All quantitative historical data has been reviewed by current QA/QC guidelines, and all applicable supporting information is justified and included in the report. [ ] Yes [ ] No

2. All qualitative historical data is verifiable, has not been used quantitatively, and has only been used in the development of a conceptual model. [ ] Yes [ ] No

3. Documentation

3.A Laboratory information package assembled as follows [ ] Yes [ ] No:

1. Sample documentation (chains of custody, preparation time, time of analysis).
2. Sample and analyte identification and quantification.
3. Determination and documentation of sample quantitation limits (SQLs).
4. Initial and continuing calibration.
5. Performance evaluation samples (external QA or laboratory control samples)
6. Matrix spike recoveries.
7. Analytical error determination (determined with replicate samples).
8. Total measurement error determination summary. (Evaluates overall precision of measurement system from sample acquisition through analysis. Determined with field duplicate and matrix spike with matrix spike duplicate).
9. Explanation and supporting documentation for flagged data.

3.B All methods used in all analysis have produced tangible raw data (e.g. chromatograms, spectra, digital values), and are available to the Department upon request.
[ ] Yes [ ] No

1. Representative data is included in documentation as examples of method procedures. [ ] Yes [ ] No

2. All flagged data is supported with complete associated tangible raw data. (e.g. depiction of matrix interferences, spiked recoveries reported outside of control limits, evidence for need for dilution etc.). [ ] Yes [ ] No

Note: Any "no" answer must be explained at the conclusion of this form. Items not applicable should be left unmarked.

4. Submitter Information

Date________________

Name of Person submitting this evaluation_____________________________________

Affiliation____

Signature______________________________ Date_____________________________

Additional Preparers____

RECAP FORM 4
SAMPLING INFORMATION SUMMARY

DATE: _________________ **Page __ of**

Site Name: ______________________________
Site Physical Address: ______________________________
____
LDEQ Site I.D. Number(s): ______________________________

Sample Location No.				
Sample Identification No.				
Laboratory Sample I.D. No.				
Date Sampled (yy,mm,dd)				
Media Sampled				
Sample Type				
Sample Collection Point				
Sampling Equipment				
Sample Depth (BGS)				
Sample Elevation (NGVD)				
Ground Surface Elevation (NGVD)				
Sampling Comments				
Replicate?	Y / N	Y / N	Y / N	Y / N
Replicate Sequence Number				

RECAP FORM 4
SAMPLING INFORMATION SUMMARY
Definitions

DATE: *Date of completion of this report (yy,mm,dd).* ***EXAMPLE: 970131***

PAGE __ of __: *Page sequence of report.* ***EXAMPLE: PAGE 1 of 2***

SITE NAME: *The name by which the site is referred to in correspondence to the LDEQ.* ***EXAMPLE: RECAP Corporation, Baton Rouge Terminal.***

SITE PHYSICAL ADDRESS: *The physical address of the site that is being evaluated.* ***EXAMPLE: 7290 BLUEBONNET BLVD, BATON ROUGE LA 70809.***

LDEQ SITE I.D. NUMBER(S): *LDEQ identification numbers that are assigned to this site.* ***EXAMPLE: LAD000000001, GD-033-0001, LA00000001, etc.***

SAMPLE LOCATION NO.: *The unique identification number assigned by the site to the location where the sample was collected.* ***EXAMPLE: B-1, MW-1, SW-3, etc.***

SAMPLE IDENTIFICATION NO.: *The unique identification number that was used to identify this sample during the sampling event.* ***EXAMPLE: 970101-A.***

LABORATORY SAMPLE I.D. NO.: *The unique identification number that was assigned to the sample by the laboratory performing an analysis of the sample.* ***EXAMPLE: 27020.01***

DATE SAMPLED: *The year, month and day the well was sampled.* ***EXAMPLE: 970101.***

MEDIA SAMPLED: *The media collected for analyses.* ***EXAMPLE: Air, Surface Water, Sediment, Ground Water, Surface Soil, Subsurface Soil, etc.***

SAMPLE TYPE: *The sampling technique that was used to collect this sample.* ***EXAMPLE: Grab, Composite.***

SAMPLE COLLECTION POINT: *Description of the point where sample is taken.* ***EXAMPLE: Borehole, Monitoring Well, Outfall Canal**, etc.*

SAMPLING INFORMATION SUMMARY
Definitions
(Continued)

SAMPLING EQUIPMENT: *The equipment used to collect the sample.* ***EXAMPLE: Bailer, Bladder pump, etc.***

SAMPLE DEPTH (BGS): *The depth below ground surface where the sample was collected measured in feet. If not applicable (above ground air sample) NA should be placed in this field.* ***EXAMPLE: 10 Feet, 5 Feet.***

SAMPLE ELEVATION (NGVD): *The elevation, in feet, of the interval where the sample was collected relative to the National Geodetic Vertical Datum of 1929. If this information has not been evaluated NE should be placed in this field.* ***EXAMPLE: +32 Feet.***

GROUND SURFACE ELEVATION (NGVD): *The elevation of the ground surface, in feet, at the location where the sample was collected relative to the National Geodetic Vertical Datum of 1929. If this information has not been evaluated NE should be placed in this field.* ***EXAMPLE: +2 Feet.***

SAMPLING COMMENTS: *Comments pertaining to the sampling event or relative to any value that was provided for the previously listed fields.*

REPLICATE: *Sample(s) collected from a well to be analyzed for the same parameter(s) during one sampling event. Please circle* ***Y*** *(Yes) or* ***N*** *(No).*

REPLICATE SEQUENCE NUMBER: *Sequential number of replicate sample(s).*
EXAMPLE: *REPLICATE?* ***Y*** *REPLICATE SEQUENCE NUMBER* ***1***

RECAP FORM 5
GROUND WATER MONITORING WELL CHARACTERISTICS

DATE: ___________________ Page __ of ___

Site Name:

Monitoring Well Characteristics

SITE MONITORING WELL NO.				
PERMIT NUMBER/AUTHORIZATION				
DOTD I.D.				
LATITUDE				
LONGITUDE				
LAT/LONG METHOD				
UNIT/AREA MONITORED				
WELL LOCATION				
WELL TYPE				
WELL STATUS				
GRADIENT				
CASING DIAMETER (INCHES)				
CASING MATERIAL				
DATE COMPLETED (yy,mm,dd)				
ZONE MONITORED				
ZONE THICKNESS (FEET)				
ELEV. OF MEASURING POINT (NGVD)				
WELL DEPTH AT INSTALLATION (FEET BGS)				
GROUND SURFACE ELEVATION (NGVD)				
TOP OF SCREENED INTERVAL (NGVD)				
BOTTOM OF SCREENED INTERVAL (NGVD)				
SUMP LENGTH (FEET)				

RECAP FORM 5
GROUND WATER MONITORING WELL CHARACTERISTICS
Definitions/List of Values

DATE: *Date of completion of this report (yymmdd). Example 970131*

PAGE __ of __: *Page sequence of report. Example Page 1 of 2*

SITE NAME: *The name by which the site is referred to in correspondence to the LDEQ.*
EXAMPLE: Ground Water Corporation, Baton Rouge Terminal

SITE MONITORING WELL NO.: *The identification commonly used by the site to identify this well in correspondence to the LDEQ.* ***EXAMPLE: MW-1***

PERMIT NUMBER / AUTHORIZATION: *The permit number or other authorization under which the well was installed.* ***EXAMPLE: GD-001-1234, LAD 000000001, GW-001***

DOTD I.D. NO.: *The identification number assigned to this well by the Louisiana Department of Transportation and Development (DOTD).* ***EXAMPLE: 295706090105501***

LATITUDE: *Latitude of the well rounded to the nearest .01 of a second.* ***EXAMPLE: 30° 28' 50.01"***

LONGITUDE: *Longitude of the well rounded to the nearest .01 of a second.* ***EXAMPLE: 90° 11' 30.01"***

LAT/LONG METHOD: *The method used to obtain the latitude and longitude of the well. The following are valid:*

SUR-GPS	=	*surveyed using differential-mode global positioning system (GPS)*
NAV-GPS	=	*surveyed using absolute-mode (navigation-quality) GPS*
SUR-C	=	*cadastral survey*
MAP	=	*digital or manual interpolation from a map or photo*
LORAN-C	=	*Loran-C navigation device or radiotriangulation*
ADDMAT	=	*address-matched to a sub-portion of a street block*
PHOTO-GM	=	*aerial photography*
SPCSCONV	=	*conversion from state plane coordinate system*
TSRCONV	=	*conversion from township-section-range system*
UTMCONV	=	*conversion from Universal Transverse Mercator (UTM) coordinates*
OTHER	=	*method other than those listed above*

UNIT/AREA MONITORED: *The designated Unit or Area intended to be monitored or from which contaminants are being recovered by this well.* ***EXAMPLE: Aeration Basin #1***

GROUND WATER MONITORING WELL CHARACTERISTICS
Definitions/List of Values
(Continued)

WELL LOCATION: *A general description of the physical location of the well within the site, which may be described by relationship to surrounding appurtenances or plant data points.* ***EXAMPLE: SW Corner of Tank 101***

WELL TYPE: *The designation of the usage of this well. Please choose one of the following: piezometer (**P**), monitoring (**M**), recovery (**R**). If other, please note.*

WELL STATUS: *The current status of the well. Please choose one of the following: active (**A**), inactive (**I**), plugged and abandoned (**P & A**). If other, please note.*

GRADIENT: *The location of this well in relation to the Unit or Area monitored and the direction of ground water flow. Please choose from the following: up (**UG**), down (**DG**), lateral (**L**). If other, please note.*

CASING DIAMETER: *The diameter of the well casing, expressed in inches.*

CASING MATERIAL: *The construction material of the inner well casing.*

The following construction materials are valid:

PVC	*PVC*
OTHPL	*Other plastic*
TEFLON	*Teflon*
SS305	*Stainless steel 305*
SS316	*Stainless steel 316*
OTHSS	*Other stainless steel*
STEEL	*Steel*
CTSTL	*Coated steel*
OTHRM	*Other metal*
TILE	*Tile*
OTHER	*Other material*

DATE COMPLETED: *The date the well was initially developed subsequent to installation (yymmdd).* ***Example: 940101***

ZONE MONITORED: *The name of the water bearing zone in which this well is screened and is commonly referred.* ***EXAMPLE: Norco Aquifer, B-Zone, 60-Foot Zone***

ZONE THICKNESS: *The thickness of the zone monitored at this well location, expressed in number of feet or ND if not determined.* ***EXAMPLE: 5'***

ELEVATION OF MEASURING POINT: *Elevation from the National Geodetic Vertical Datum (NGVD) of the point on top of the inner casing of the well which is used as a reference point for well measurements, to .01 feet.* ***EXAMPLE: + 23.55 ft***

WELL DEPTH AT INSTALLATION: *Elevation from the NGVD of the depth of well at time of installation, to .01 feet.* ***EXAMPLE: - 23.01 ft***

GROUND WATER MONITORING WELL CHARACTERISTICS
Definitions/List of Values
(Continued)

GROUND SURFACE ELEVATION: *Elevation from the NGVD of the ground surface at the well location, to .01 feet.* ***EXAMPLE: + 20.55 ft***

TOP OF SCREENED INTERVAL: *Elevation from the NGVD of the top of the well screen, to .01 feet.* ***EXAMPLE: - 25.01 ft***

BOTTOM OF SCREENED INTERVAL: *Elevation from the NGVD of the bottom of the well screen, to .01 feet.* ***EXAMPLE: - 30.01 ft***

SUMP LENGTH: *Length of the blank section of casing below the base of the screened interval, to .01 feet.* ***EXAMPLE: 2.00 ft***

RECAP FORM 6
GROUND WATER MONITORING WELL SAMPLING EVENT SUMMARY

DATE: ________________ **Page ___ of ___**

Site Name: ____

SITE MONITORING WELL NO.				
DOTD I.D.				
Date Sampled (yy,mm,dd)				
Gallons purged				
Purge Method				
Sampling Equipment				
Depth to Ground Water (ft)				
Ground Water Elevation Prior to Purging (NGVD)				
Well Depth for this Sampling Event (NGVD)				
Comments				
Sampling Frequency				

RECAP FORM 6
GROUND WATER MONITORING WELL SAMPLING EVENT SUMMARY
Definitions/List of Values

DATE: *Date of completion of this report (yymmdd). Example: 970131*

PAGE__of__: *Page sequence of report. Example: Page 1 of 2.*

SITE NAME: *The name by which the site is referred to in correspondence to the LDEQ.* ***EXAMPLE: Ground water Corporation, Baton Rouge Terminal***

SITE MONITORING WELL NO.: *The identification which is commonly used by the site to identify this well in correspondence to the LDEQ.* ***EXAMPLE: MW-1***

DOTD I.D. NO.: *The identification number which has been assigned to this well by the Louisiana Department of Transportation and Development (DOTD).* ***EXAMPLE: 295706090105501***

DATE SAMPLED: *The year, month and day the well was sampled.* ***EXAMPLE: 940101***

GALLONS PURGED: *The total volume of liquids removed from the well prior to sampling, expressed in gallons.* ***EXAMPLE: 25.5 gal.***

PURGE METHOD: *The method used to purge liquids from each well prior to sampling.* ***EXAMPLE: bailer***

SAMPLING EQUIPMENT: *The equipment used to collect the sample.* ***EXAMPLE: bailer***

DEPTH TO GROUND WATER: *The depth to ground water measured from the reference point to .01 feet.* ***EXAMPLE: 7.77 ft***

GROUND WATER ELEVATION PRIOR TO PURGING: *The elevation from the NGVD of the ground water prior to purging the well.* ***EXAMPLE: -7.77 ft***

WELL DEPTH FOR THIS SAMPLING EVENT: *The total depth of the well, relative to NGVD, as measured during this sampling event. If no total depth measurement is taken during the sampling event please state* ***NM*** *(not measured).* ***EXAMPLE -35.33 ft***

COMMENTS: *Note any pertinent comments regarding the sampling event.* ***EXAMPLE: Very Turbid, Sample Dilution***

SAMPLING FREQUENCY: *The frequency that the well is sampled. Please use Monthly (M), Quarterly (Q), Semi-Annually (SA), Annually (A). Note any other sampling frequency.*

RECAP FORM 7

SITE-SPECIFIC ENVIRONMENTAL FATE AND TRANSPORT DATA SUMMARY

Area of Investigation: ____

[ ] $Soil_i$, [ ] $Soil_{ni}$, $Soil_i$-PEF [ ] or $Soil_{ni}$- PEF [ ]:

VF:

Area of impacted soil (acre):	____________
D_A (cm^2/s)	____________
T (sec)	____________
Q_a (L_{air}/L_{soil})	____________
n (L_{air}/L_{soil})	____________
Q/C (g/m^2-s per kg/m^3):	____________
ρ_b (g/cm^3):	____________
θ_W (L_{water}/L_{soil}):	____________
ρ_s (g/cm^3):	____________
f_{oc} (g/g):	____________

PEF:

Area of impacted soil (acre):	____________
Q/C (g/m^2-s per kg/m^3):	____________
V (unitless):	____________
U_m (m/s):	____________
U_t (m/s):	____________
F(x) (unitless):	____________

[ ] $Soil_{es}$:

VF:

ρ_s (g/cm^3):	____________
ρ_b (g/cm^3):	____________
D_s (cm^2/sec)	____________
n (L_{pore}/L_{soil})	____________
L_s (cm):	____________
θ_W (L_{water}/L_{soil}):	____________
θ_a (L_{airr}/L_{soil}):	____________
ER (l/s):	____________
L_B (cm):	____________
D_{crack} (cm^2/s)	____________
L_{crack} (cm):	____________
f_{oc} (g/g):	____________
FC (cm^2 cracks/cm^2 total area):	____________

D_s:

ρ_b (g/cm^3): ______________________
θ_W (L_{water}/L_{soil}): ______________________
θ_a (L_{air}/L_{soil}): ______________________
n (L_{pore}/L_{soil}): ______________________
ρ_s (g/cm^3): ______________________

D_{crack}:

ρ_b (g/cm^3): ________________
θ_{wcrack} (cm^3-H_2O/cm^3-total volume): ________________
θ_{acrack} (cm^3-air/cm^3-total volume): ________________
n (L_{pore}/L_{soil}): ________________
ρ_s (g/cm^3): ________________

[ ] $Soil_{GW}$ Method 1:

$GW_{1,2,3DW,3NDW}$ (mg/l) ________________
ρ_b (g/cm^3): ________________
θ_W (L_{water}/L_{soil}): ________________
f_{oc} (g/g): ________________
ρ_s (g/cm^3): ________________
θ_a (L_{air}/L_{soil}): ________________
n (L_{pore}/L_{soil}): ________________

Summers Model:

Area of impacted soil (acre): ________________
Q_A (m^3/d): ________________
Q_p (m^3/d): ________________
C_l (mg/l) ________________

Q_p:

I (m/yr): ________________
S_w (m): ________________
L (m):

Q_a:

D_v (m/yr): ________________
S_d (m): ________________
S_w (m):

C_l:

C_{Tw} (mg/kg): __________________
ρ_b (g/cm^3): __________________
n (cm^3/cm^3): __________________
θ_W (L_{water}/L_{soil}): __________________
f_{oc} (g/g):

S_d:

h_{adv} (ft): __________________
h_{disp} (ft):

H_{adv}:

I (ft/yr): __________________
D_v (ft/yr): __________________
B (ft): __________________
L (ft):

h_{disp}:

α_z (ft): __________________
L (ft):

Domenico Model:

Area of impacted soil (acre): __________________
S_w (ft): __________________
D_v (ft/yr): __________________
n (unitless): __________________
λ_i (unitless): __________________
R_i (unitless) : __________________
i (ft/ft): __________________
x (ft): __________________
S_d (ft): __________________
K (ft/yr): __________________
V: __________________
α_x (ft) __________________
α_y (ft) __________________
α_z (ft) __________________
erf __________________

S_d:

h_{adv} (ft): __________________
h_{disp} (ft):

[ ] $Soil_{GW}$ Method 2:

$GW_{1,2,3DW,3NDW}$ (mg/l) ____________________
GW_{conc} (mg/l): ____________________
$Soil_{conc}$ (mg/kg): ____________________

$Soil_{sat}$:

ρ_b (g/cm^3): ____________________
f_{oc} (g/g): ____________________
θ_W (L_{water}/L_{soil}): ____________________
ρ_s (g/cm^3): ____________________
θ_a (L_{air}/L_{soil}): ____________________
n (L_{pore}/L_{soil}): ____________________

[ ] GW_2 or [ ] GW_3:

Domenico Model:

Area of impacted soil (acre): ____________________
S_w (ft): ____________________
D_v (ft/yr): ____________________
n (unitless): ____________________
λ_i (unitless): ____________________
R_i (unitless) : ____________________
i (ft/ft): ____________________
x (ft): ____________________
S_d (ft): ____________________
K (ft/yr): ____________________
V: ____________________
α_x (ft) ____________________
α_y (ft) ____________________
α_z (ft) ____________________
erf ____________________

S_d:

h_{adv} (ft): ____________________
h_{disp} (ft):

[ ] GW_{es}:

C_a (ug/m^3): ____________________
VF (mg/m^3/mg/l):

VF:

L_{GW} (cm): ____________________
ER (l/s): ____________________
L_B (cm): ____________________
L_{crack} (cm): ____________________
FC (cm^3 cracks/cm^3 total area): ____________________
D_{ws} (cm^2/s): ____________________
D_{crack} ((cm^2/s): ____________________

D_{ws}:

h_{cap} (cm): ____________________
h_v (cm): ____________________
D_{cap} (cm^2/s): ____________________
D_s (mg/kg): ____________________

D_{crack}:

θ_{acrack} (cm^3-air/cm^3 total volume): ____________________
θ_{wcrack} (cm^3-water/cm^3 total volume): ____________________
n (cm^3/cm^3-soil): ____________________
ρ_b (g/cm^3): ____________________
ρ_s (g/cm^3): ____________________

D_{cap}:

n (cm^3/cm^3-soil): ____________________
ρ_b (g/cm^3): ____________________
ρ_s (g/cm^3): ____________________
θ_{acap} (cm^3-air/cm^3-soil) ____________________
θ_{wcap} (cm^3-H_2O/cm^3-soil) ____________________

D_s:

θ_a (L_{air}/L_{soil}): ____________________
ρ_b (g/cm^3): ____________________
ρ_s (g/cm^3): ____________________
θ_W (L_{water}/L_{soil}): ____________________
n (L_{pore}/L_{soil}): ____________________

[ ] GW_{air}:

C_a (ug/m^3): ____________________
VF (mg/m^3/mg/l):

VF:

D_{ws} (cm^2/s): ____________________

L_{GW} (cm): ____________________

U_{air} (cm/s): ____________________

W (cm): ____________________

δ_{air} (cm): ____________________

D_{ws}:

h_{cap} (cm): ____________________

h_v (cm): ____________________

D_{cap}:

θ_{acap} (cm^3-air/cm^3-soil) ____________________

n (cm^3/cm^3-soil): ____________________

θ_{wcap} (cm^3-water/cm^3-soil) ____________________

ρ_b (g/cm^3): ____________________

ρ_s (g/cm^3): ____________________

D_s:

θ_a (L_{airr}/L_{soil}): ____________________

ρ_b (g/cm^3): ____________________

ρ_s (g/cm^3): ____________________

θ_W (L_{water}/L_{soil}): ____________________

n (L_{porer}/L_{soil}):

RECAP FORM 8
CHEMICAL-SPECIFIC DATA SUMMARY

Hierarchy of References for Chemical-Specific Values:

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________

Hierarchy of References for Toxicity Values:

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________

[ ] Soil$_i$, [ ] Soil$_{ni}$, [ ] Soil$_i$-PEF, or [ ] Soil$_{ni}$-PEF:

Toxicity Data:

COC	RfD$_o$ mg/kg-d	Ref	RfD$_i$ mg/kg-d	Ref	Target(s)	Ref	SF$_o$ (mg/kg-d)$^{-1}$	Ref	SF$_i$ (mg/kg-d)$^{-1}$	Ref

VF:

COC	D_i (cm^2/s)	Ref	H ($atm\text{-}m^3/mol$)	H' (unitless)	Ref	D_w (cm^2/s)	Ref	K_d (cm^3/g)	Ref	K_{oc} (cm^3/g)	Ref

[ ] Soil$_{es}$:

Toxicity Data:

COC	RfD_o mg/kg-d	Ref	RfD_i mg/kg-d	Ref	Target(s)	Ref	SF_o $(mg/kg\text{-}d)^{-1}$	Ref	SF_i $(mg/kg\text{-}d)^{-1}$	Ref

VF:

COC	D_i (cm^2/s)	Ref	H ($atm\text{-}m^3/mol$)	H' (unitless)	Ref	D_w (cm^2/s)	Ref	K_d (cm^3/g)	Ref	K_{oc} (cm^3/g)	Ref

D_s and D_{crack}:

COC	H ($atm\text{-}m^3/mol$)	H' (unitless)	Ref	D_{air} (cm^2/s)	Ref	D_{wat} (cm^2/s)	Ref

[ ] Soil$_{GW}$ Method 1:

Soil/water partition equation and Summers model:

COC	H (atm-m^3/mol)	H' (unitless)	Ref	K_d (cm^3/g)	Ref	K_{oc} (cm^3/g)	Ref

[ ] Soil$_{sat}$:

COC	S (mg/l)	Ref	H (atm-m^3/mol)	H' unitless)	Ref	K_d (cm^3/g)	Ref	K_{oc} (cm^3/g)	Ref

[ ] GW_1 or [ ] GW_2:

Toxicity Data:

COC	RfD_o mg/kg-d	Ref	RfD_i mg/kg-d	Ref	Target(s)	Ref	SF_o $(mg/kg\text{-}d)^{-1}$	Ref	SF_i $(mg/kg\text{-}d)^{-1}$	Ref

[ ] GW_3:

Toxicity Data:

COC	RfD_o mg/kg-d	Ref	RfD_i mg/kg-d	Ref	Target(s)	Ref	SF_o $(mg/kg\text{-}d)^{-1}$	Ref	SF_i $(mg/kg\text{-}d)^{-1}$	Ref	BCF (l/kg)	Ref

[ ] GW_{es}:

Toxicity Data:

COC	RfD_o mg/kg-d	Ref	RfD_i mg/kg-d	Ref	Target(s)	Ref	SF_o $(mg/kg\text{-}d)^{-1}$	Ref	SF_i $(mg/kg\text{-}d)^{-1}$	Ref

VF:

COC	H $(atm\text{-}m^3/mol)$	H' (unitless)	Ref

D_{crack}, D_{cap} and D_s:

COC	H (atm-m^3/mol)	H' (unitless)	Ref	D_{air} (cm^2/s)	Ref	D_{wat} (cm^2/s)	Ref

[ ] GW_{air}:

Toxicity Data:

COC	RfD_o mg/kg-d	Ref	RfD_i mg/kg-d	Ref	Target(s)	Ref	SF_o (mg/kg-d)$^{-1}$	Ref	SF_i (mg/kg-d)$^{-1}$	Ref

VF:

COC	D_i (cm^2/s)	Ref	H ($atm\text{-}m^3/mol$)	H' (unitless)	Ref	D_w (cm^2/s)	Ref	K_d (cm^3/g)	Ref	K_{oc} (cm^3/g)	Ref

D_{cap} and D_s:

COC	H ($atm\text{-}m^3/mol$)	H' (unitless)	Ref	D_{air} (cm^2/s)	Ref	D_{wat} (cm^2/s)	Ref

RECAP FORM 9
MANAGEMENT OPTION 3 SITE-SPECIFIC EXPOSURE DATA SUMMARY

Receptor: ___________________________________

Parameter	Definition	Input Value	Reference
TR	target excess individual lifetime cancer risk (unitless)		
EF	exposure frequency (days/yr)		
ED	exposure duration (yr)		
ET	exposure time (hr)		
BW	body weight (kg)		
IRS	soil ingestion rate (mg/day)		
IRA	inhalation rate (m^3/day)		
IRW	water ingestion rate (L/day)		
SA	skin surface area (cm^2/day)		
AF	soil-to-skin adherence factor (mg/cm^2)		
IRF	fish/shellfish ingestion rate (kg/day)		
IRW_i	incidental water ingestion rate (L/day)		
Other:			

RECAP FORM 10
SCREENING OPTION SUBMITTAL FOR SOIL

SOIL - Identification of the Limiting SO SS:

COC	❑ $Soil_{SSi}$ ❑ $Soil_{SSni}$	$Soil_{SSGW}$	Limiting SS

SOIL – Identification of the AOIC:

COC	Maximum Concentration

SO SOIL RECAP ASSESSMENT:

COC	Limiting SS	Maximum Concentration	AOIC Exceeds LSS?

RECAP FORM 11
MANAGEMENT OPTION 1 SUBMITTAL FOR SOIL 0-15 FT BGS

SOIL 0-15 ft bgs - Identification of the Limiting MO-1RS:

COC	❑ $Soil_i$ ❑ $Soil_{ni}$	Additivity Divisor	Final ❑ $Soil_i$ ❑ $Soil_{ni}$	❑ $Soil_{GW1}$ ❑ $Soil_{GW2}$ ❑ $Soil_{GW3DW}$ ❑ $Soil_{GW3NDW}$	❑NO DF ❑ DF2 ❑ DF3 ❑ DF3	Final $Soil_{GW}$	❑ $Soil_{es}$	$Soil_{sat}$	Limiting MO-1 RS

SOIL 0-15 ft bgs – Identification of the AOIC:

COC	Maximum Concentration	95%UCL-AM Concentration	AOI Concentration

MO-1 SOIL 0-15 ft bgs RECAP ASSESSMENT:

COC	Limiting MO-1 RS	AOI Concentration	AOIC Exceeds MO-1 LRS?

RECAP FORM 12
MANAGEMENT OPTION 1 SUBMITTAL FOR SOIL > 15 FT BGS

SOIL >15 ft bgs - Identification of the Limiting MO-1RS:

COC	❑ $Soil_{GW1}$ ❑ $Soil_{GW2}$ ❑ $Soil_{GW3DW}$ ❑ $Soil_{GW3NDW}$	❑ NO DF ❑ DF2 ❑ DF3 ❑ DF3	Final $Soil_{GW}$	$Soil_{sat}$	Limiting MO-1RS

SOIL >15 ft bgs – Identification of the AOIC:

COC	Maximum Concentration	95%UCL-AM Concentration	AOI Concentration

MO-1 SOIL > 15 FT BGS RECAP ASSESSMENT:

COC	Limiting MO-1 RS	AOI Concentration	AOIC Exceeds MO-1 LRS?

RECAP FORM 13
MANAGEMENT OPTION 2 or 3 SUBMITTAL FOR SOIL 0-15 FT BGS

SOIL 0-15 ft bgs - Identification of the Limiting RS:

COC	❑ $Soil_i$ ❑ $Soil_{ni}$	Additivity Divisor	Final ❑ $Soil_i$ ❑ $Soil_{ni}$	❑ $Soil_{GW1}$ ❑ $Soil_{GW2}$ ❑ $Soil_{GW3DW}$ ❑ $Soil_{GW3NDW}$	❑NO DAF ❑ DAF2 ❑ DAF3 ❑ DAF3	Final $Soil_{GW}$	$Soil_{sat}$	$Soil_{es}$	Additivity Divisor	Final $Soil_{es}$	Limiting RS

SOIL 0-15 ft bgs – Identification of the AOIC:

COC	Maximum Concentration	95%UCL-AM Concentration	AOI Concentration

MO-2 SOIL 0-15 ft bgs RECAP ASSESSMENT:

COC	Limiting RS	AOI Concentration	AOIC Exceeds LRS?

RECAP FORM 14
MANAGEMENT OPTION 2 or 3 SUBMITTAL FOR SOIL > 15 FT BGS

SOIL > 15 ft bgs- Identification of the Limiting RS:

COC	❑ $Soil_{GW1}$ ❑ $Soil_{GW2}$ ❑ $Soil_{GW3DW}$ ❑ $Soil_{GW3NDW}$	❑NO DAF ❑ DAF2 ❑ DAF3 ❑ DAF3	Final $Soil_{GW}$	$Soil_{sat}$	$Soil_{es}$	Additivity Divisor	Final $Soil_{es}$	Limiting RS

SOIL > 15 ft bgfs – Identification of the AOIC:

COC	Maximum Concentration	95%UCL-AM Concentration	AOI Concentration

MO-2 SOIL > 15 ft bgs RECAP ASSESSMENT:

COC	Limiting RS	AOI Concentration	AOIC Exceeds LRS?

RECAP FORM 15
SCREENING OPTION SUBMITTAL FOR GROUNDWATER

GROUNDWATER - Identification of the SO SS:

COC	GW_{SS}

GROUNDWATER – Compliance Concentration:

COC	Compliance Concentration

SO GROUNDWATER RECAP ASSESSMENT:

COC	GW_{SS}	Compliance Concentration	CC Exceeds SS?

RECAP FORM 16
MANAGEMENT OPTION 1 SUBMITTAL FOR GROUNDWATER

GROUNDWATER - Identification of the Limiting MO-1RS:

COC	❑ GW_1 ❑ GW_2 ❑ GW_{3DW} ❑ GW_{3NDW}	❑ NO DAF ❑ DAF2 ❑ DAF3 ❑ DAF3	Final ❑ GW_1 ❑ GW_2 ❑ GW_{3DW} ❑ GW_{3NDW}	❑ GW_{es}	❑ GW_{air}	$Water_{sol}$	Limiting MO-1 RS

GROUNDWATER – Compliance Concentration:

COC	Compliance Concentration

MO-1 GROUNDWATER RECAP ASSESSMENT:

COC	Limiting MO-1 RS	Compliance Concentration	CC Exceeds MO-1 LRS?

RECAP FORM 17
MANAGEMENT OPTION 2 or 3 SUBMITTAL FOR GROUNDWATER

GROUNDWATER - Identification of the Limiting RS:

COC	❑ GW_1 ❑ GW_2 ❑ GW_{3DW} ❑ GW_{3NDW}	❑NO DAF ❑ DAF2 ❑ DAF3 ❑ DAF3	Final ❑ GW_1 ❑ GW_2 ❑ GW_{3DW} ❑ GW_{3NDW}	$Water_{sol}$	❑ GW_{es}	❑GW_{air}	Limiting RS

GROUNDWATER – Compliance Concentration:

COC	Compliance Concentration

MO-2 GROUNDWATER RECAP ASSESSMENT:

COC	Limiting RS	Compliance Concentration	CC Exceeds LRS?

RECAP FORM 18
ECOLOGICAL CHECKLIST

Section 1 - Facility Information

1. Name of facility: ____

2. Location of facility: ____

   Parish: ____

3. Mailing address: ____

4. Type of facility and/or operations associated with AOC:

   ____

5. Name of AOC or AOI: ____

6. If available, attach a USGS topographic map of the facility and/or aerial or other photographs of the release site and surrounding areas.

Section 2 - Land Use Information

1. Describe land use at and in the vicinity of the AOC/AOI: ______________________

   ____

2. Describe land use adjacent to the facility: ______________________________

   ____

3. Provide the following information regarding the nearest surface water body which has been impacted or has the potential to be impacted by COC migrating from the AOC/AOC:

a) Name of the surface water body: ______________________________

b) Type of surface water body:

   [ ] freshwater river or stream
   [ ] freshwater swamp/marsh/wetland
   [ ] saltwater or brackish swamp/marsh/wetland
   [ ] lake or pond
   [ ] bayou or estuary
   [ ] drainage ditch
   [ ] other: ______________________

c) Designated use of the segment/subsegment of the surface water body (LAC 33:IX):__________________

   ____

d) Distance from the AOC/AOI to nearest surface water body: ______________________

4. Do any potentially sensitive environmental areas exist adjacent to or in proximity to the site, e.g., federal and state parks, national and state monuments, wetlands, etc? [ ] Yes [ ] No

If yes, explain:
____

Section 3 - Release Information

1. Nature of the release: ____

2. Location of the release (within the facility): ____

3. Location of the release with respect to the facility property boundaries: _______________________

____

4. Constituents known or suspected have been released: ___________________________________

____

5. Indicate which media are known or suspected to be impacted and if sampling data are available:

[ ]	soil 0 - 3 feet bgs	[ ] yes [ ] no
[ ]	soil 0 - 15 feet bgs	[ ] yes [ ] no
[ ]	soil >15 feet bgs	[ ] yes [ ] no
[ ]	groundwater	[ ] yes [ ] no
[ ]	surface water/sediment	[ ] yes [ ] no

6. Has migration occurred outside the facility property boundaries? [ ] yes [ ] no

If yes, describe the designated use of the offsite land impacted:
____

Section 4 - Criteria for Further Assessment

If the AOI meets **all** of the criteria presented below, then typically no further ecological evaluation shall be required. If the AOI **does not** meet **all** of the criteria, then a screening level ecological risk shall be conducted. The Submitter should make the initial decision regarding whether or not a screening level ecological risk assessment is warranted based on compliance of the AOI with criteria listed below. After review of the ecological checklist and other available site information, the Department will make a final determination on the need for a screening level ecological risk assessment. If site conditions at the AOI change such that one or more of the criteria are not met, then a screening level ecological risk assessment shall be conducted. Answers shall be based on current site conditions (i.e., shall not consider future remedial actions or institutional or engineering controls).

Indicate if the AOI meets the following criteria:

(1) The area of impacted soil is approximately 5 acres or less in size (based on the AOI identified for the human health assessment) and it is not expected that the COC will migrate such that the soil AOI becomes greater than 5 acres in size. [ ] yes [ ] no

(2) There is no current release or demonstrable long-term threat of release (via runoff or groundwater discharge) of COC from the AOI to a surface water body. [ ] yes [ ] no

(3) Recreational species, commercial species, threatened or endangered species, and/or their habitats are not currently being exposed, or expected to be exposed, to COC present at or migrating from the AOI.
[ ] yes [ ] no

(4) There are no obvious impacts to ecological receptors or their habitats and none are expected in the future.
[ ] yes [ ] no

Is further ecological evaluation required at this AOI? [ ] yes [ ] no
This determination is subject to Department concurrence.

Section 5 - Site Summary

The ecological checklist submittal shall include a site summary that presents sufficient information to verify that the AOI meets or does not meet the criteria for further assessment.

Section 6 - Submitter Information

Date: ______________________________________

Name of person submitting this checklist: ____

Affiliation: ____

Signature: ____________________________________ Date: ____

Additional Preparers: ____

APPENDIX D

GUIDELINES FOR ASSESSING:

- **PETROLEUM HYDROCARBONS**
- **POLYCYCLIC AROMATIC HYDROCARBONS**
- **LEAD**
- **POLYCHLORINATED DIBENZODIOXINS AND POLYCHLORINATED DIBENZOFURANS**
- **NON-TRADITIONAL PARAMETERS**

PETROLEUM HYDROCARBONS

GUIDELINES FOR ASSESSING PETROLEUM HYDROCARBONS

This Appendix presents guidelines for a risk-based approach for the assessment and management of soil and groundwater impacted by petroleum hydrocarbons. This approach includes the evaluation of indicator constituents and residual petroleum hydrocarbon constituents.

Petroleum-impacted soil and groundwater shall be assessed using the **TPH Fraction and Indicator Approach** as described by the TPH Criteria Working Group (TPHCWG) (TPGCWG, 1997c). The TPH Fraction and Indicator Approach is based on the assessment of: (1) individual petroleum-related constituents (indicators) using constituent-specific toxicity criteria and physical/chemical properties, **and** (2) total petroleum hydrocarbon (TPH) fractions using fraction-specific toxicity criteria and physical/chemical properties. The indicator constituents and hydrocarbon fractions are identified for different types of releases in Table D-1. In the absence of fraction-specific data, the evaluation of petroleum-impacted media shall include the assessment of: (1) individual petroleum-related constituents (indicators) using constituent-specific toxicity criteria and physical/chemical properties, **and** (2) total petroleum hydrocarbon mixtures (TPH-GRO, TPH-DRO, and/or TPH-ORO).

The hydrocarbon fractions for the TPH Fraction and Indicator Approach were defined based on: (1) environmental behavior and (2) equivalent carbon number. Fractions were defined separately for aliphatics and aromatics due to the great variation in environmental behavior between these two chemical groups. To define the TPH fractions, the potential for individual TPH constituents to leach from soil to groundwater and to volatilize from soil to air was modeled using equations from *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (American Society for Testing and Materials, 1995). The individual constituents were grouped into fractions based on their modeled environmental behavior. Fractions of these TPH constituents were then defined such that the difference in modeled environmental behavior between the fractions was no greater than an order of magnitude. Each of these fractions were then further subdivided based on the equivalent carbon number index. The equivalent carbon number index is related to: (1) the boiling points; and (2) the retention times in a gas chromatographic column of individual TPH constituents, normalized to the n-alkanes. Fate and transport parameter values were assigned to each fraction based on the average values of the individual constituents comprising the fraction (TPHCWG, 1997a). These values are presented in Table D-2. For additional information on how these fractions were defined refer to *Total Petroleum Hydrocarbon Working Group Series Volume 3, Selection of Representative TPH Fractions Based on Fate and Transport Considerations* (TPHCWG, 1997a).

Oral reference doses (RfD_o) and inhalation reference concentrations (RfC) were derived for aliphatic and aromatic fractions based on the best available toxicity data for individual TPH constituents, well-defined petroleum mixtures, and whole petroleum products. The RfD_o and RfC were developed in accordance with EPA methodologies and provide a representative and conservative estimate of each fraction's toxicity. The RfC values (mg/m^3) were converted to inhalation reference doses (RfD_i) (mg/kg-day) by dividing by a body weight of 70 kg and multiplying by an inhalation rate of 20 m^3/day. The RfD_o and RfD_i for the TPH fractions are presented in Table D-3. For additional information on how these toxicity values were derived for the TPH fractions refer to

Total Petroleum Hydrocarbon Working Group Series Volume 4, Development of Fraction Specific Reference Doses (RfDs) and Reference Concentrations (RfCs) for Total Petroleum Hydrocarbons (TPH) (TPHCWG, 1997b).

The LDEQ approach presented herein differs from the TPH Fraction and Indicator Approach (TPHCWG, 1997b and 1997c) in that: (1) toluene, xylene, and ethylbenzene are evaluated as indicator constituents in lieu of aromatic fractions $C_{>5}$-C_7 and $C_{>7}$-C_8; and (2) the approach has been modified to include the evaluation of TPH-GRO, TPH-DRO, and TPH-ORO mixture data.

The analytical methods suggested for the identification and quantitation of the designated hydrocarbon fractions include the Massachusetts Department of Environmental Protection's VPH/EPH (volatile petroleum hydrocarbons/extractable petroleum hydrocarbon) Method (http://www.state.ma.us/dep/bwsc/vph_eph.htm) and the Texas Commission on Environmental Quality Method 1006 (http://www.tnrcc.state.tx.us/permitting/analysis.htm#5035). When requesting these analyses, the data user must specify that the carbon ranges to be reported match those found in Table D-1, and that the results be reported on a "wet-weight" basis.

The analytical methods that shall be used for the quantitation of TPH-GRO (C_6 - C_{10}) (purgeable), TPH-DRO (C_{10} - C_{28}) (extractable), and TPH-ORO (> C_{28}) (extractable) (ASTM 1739-95) hydrocarbon mixtures include: (1) SW846 Method 8015B (modified-extraction/GC-FID); (2) more current EPA method; or (3) Texas Commission on Environmental Quality Method 1005 (htpp://www.tnrcc.state.tx.us/permitting/analysis.htm#5035). For the analysis of PAH constituents, EPA SW846 Method 8310 or EPA SW846 Method 8270 may be used. It is the Submitter's responsibility that the method chosen will achieve SQL that are acceptable under the RECAP based on site-specific conditions, the COC present, and method-specific limitations.

If TPH fractionation data and TPH mixture data have both been collected at an AOI and the two data sets yield different conclusions concerning management of the AOI, then management decisions shall be based on the fractionation data since the fractionation method yields more specific information regarding the TPH constituents present and thus more accurately characterizes site conditions.

Site investigation data collected in accordance with the methods specified in RECAP June 2000 prior to the promulgation of RECAP 2003 shall be considered acceptable for use under the RECAP.

TPH Fraction and Indicator Approach

Note: The indicator constituents **and** TPH fractions shall be identified and quantitated at **all** sites where petroleum hydrocarbons have been released.

1. ***Indicator Constituents***. The indicator constituents shall be identified and quantitated as individual constituents using appropriate analytical methods. The indicator constituent(s) for petroleum-impacted soils are identified in Table D-1. (Note: benzo[j]fluorene, benzo[ghi]perylene, dibenz[ah]acridine, dibenz[aj]acridine, 7H-dibenzo[cg]carbazole, dibenz[ae]pyrene, dibenzo[ah]pyrene, dibenzo[ai]pyrene, and

3-methylchloanthrene are included as analytes for some EPA methods. These PAHs are not used as indicator constituents for the TPH Fraction and Indicator Approach. Therefore, it is not required that these constituents be evaluated. These constituents will be evaluated as components of the aromatic TPH fractions.)

The AOIC and/or CC for each indicator constituent detected at the AOI shall be compared to the appropriate RS. (Refer to Section 2.8 for guidance on determining the AOIC and/or compliance concentration).

2. ***Hydrocarbon Fractions (or Hydrocarbon Mixtures)***. The TPH Fraction and Indicator Approach hydrocarbon fractions shall be identified and quantitated using an appropriate analytical method (refer to the previous page for suggested analytical methods). In lieu of identifying and quantitating the hydrocarbon fractions designated by the TPH Fraction and Indicator Approach, TPH-GRO (C_6–C_{10}), TPH-DRO (C_{10}–C_{28}) (extractable), and/or TPH-ORO (C_{28}–$C_{>35}$) (extractable) hydrocarbon mixtures may be identified and quantitated using an appropriate analytical method (refer to the previous page for suggested analytical methods). The hydrocarbon fractions and hydrocarbon mixtures that shall be identified and quantitated for different types of petroleum releases are presented in Table D-1.

   The AOIC and/or CC detected for each hydrocarbon fraction or hydrocarbon mixture at the AOI shall be compared to the limiting SS or RS. The total concentration of petroleum hydrocarbons present in each impacted medium at an AOI shall be less than or equal to 10,000 ppm. The total petroleum hydrocarbon concentration shall be determined by summing the AOIC or compliance concentration for each aliphatic and aromatic hydrocarbon fraction detected in the medium of concern at the AOI or by summing the AOIC or compliance concentration for each hydrocarbon mixture detected in the medium of concern at the AOI.

Odors/Aesthetics

The Submitter may be required to remediate to petroleum hydrocarbon concentrations that are lower than the concentrations specified by this Program if compliance with MO-1, MO-2, or MO-3 RS results in a visual or odor nuisance that compromises the aesthetic value and/or land use of the site. For example, for a release of diesel fuel in an industrial area, where all the indicator constituents for petroleum-impacted soils are met and the TPH-DRO hydrocarbon concentration is less than or equal to the RS but a constant, objectionable odor is evident, the submitter may recommend and complete excavation of the affected soils to aesthetically acceptable concentrations. This new clean up goal would be governed by the aesthetic appearance and odor of the soil only, **not a revised risk-based RS**. The Submitter should determine the aesthetic concentration and propose a plan to address the soils in an appropriate manner.

SS and RS for TPH-GRO, TPH-DRO, and TPH-ORO

For the generation of SS and RS for TPH-GRO, TPH-DRO, and TPH-ORO for Tables 1, 2, and 3, the aliphatic or aromatic fraction with the most protective RfD was used to represent the entire TPH mixture [gasoline (TPH-GRO), diesel (TPH-DRO), and oil (TPH-ORO)] was represented. TPH-GRO is represented by the RfD for Aromatics $C_{>8}$-C_{12} (RfD_o of 0.04 mg/kg-d); RfD_i of 0.06 mg/kg-d). TPH-DRO is represented by the RfD for Aromatics $C_{>10}$-C_{21} (RfD_o of 0.03 mg/kg-d; RfD_i of 0.06 mg/kg-d). TPH-ORO is represented by the RfD (RfD_o of 0.03 mg/kg-d) for Aromatics $C_{>16}$-C_{35}.

Adjusting TPH RS for Additivity

The critical effects/target organs for the TPH-related constituents are presented in Table D-4. When adjusting for additive health effects, the TPH fractions and mixtures should be treated as **individual** constituents. It should be noted that: 1) the RfD for aliphatic fractions $C_{>8}$-C_{10}, $C_{>10}$–C_{12}, and $C_{>12}$-C_{16} account for additive health effects and therefore, for the purposes of adjusting for additivity, these three fractions should be treated as one fraction – not three fractions; 2) the RfD for aromatic fractions $C_{>8}$-C_{10}, $C_{>10}$–C_{12}, and $C_{>12}$-C_{16} account for additive health effects and therefore, for the purposes of adjusting for additivity, these three fractions should be treated as one fraction – not three fractions; and 3) the RfD for aromatic fractions $C_{>16}$-C_{21} and $C_{>21}$–C_{35} account for additivity and therefore, for the purposes of adjusting for additivity, these two fractions should be treated as one fraction – not two fractions. For additional guidance on adjusting RS to account for additive health effects refer to Appendix G.

Additivity Example: Gasoline release - adjusting the $Soil_i$ to account for additive health effects:

COC present: ethylbenzene, toluene, aliphatics $C_{>6}$-C_8, aliphatics $C_{>8}$-C_{10}, aliphatics $C_{>10}$-C_{12}, aromatics $C_{>8}$-C_{10} and aromatics $C_{>10}$-C_{12}

Targets: Liver (L): 3 COC (ethylbenzene, toluene, aliphatics $C_{>8}$-C_{12})
Kidney (K): 3 COC (ethylbenzene, toluene, aliphatics $C_{>6}$-C_8)
Body weight (BW): 1 COC (aromatics $C_{>8}$-C_{12})

Adjustment of $Soil_i$:

COC	Table 3 $Soil_i$	Appendix H Worksheet 5 $Soil_i$	Target	Adjusted $Soil_i$
Ethylbenzene	13,000		K,L	13,000/3 = **4333**
Toluene	83,000		K,L	83,000/3 = **27,666**
Aliphatics $C_{>6}$-C_8	**10,000**	82,800	K	82,800/3 = 27,333 (27,333 > 10,000 so use **10,000**)
Aliphatics $C_{>8}$-C_{10}	8800		L	8800/3 = **2933**
Aliphatics $C_{>10}$-C_{12}	**10,000**	18,600	L	18,600/3 = **6200**
Aromatics	5,000		BW	**5000**

$C_{>8}$-C_{10}				
Aromatics $C_{>10}$-C_{12}	**10,000**	10,100	BW	**10,000**

Note: Additivity does not apply to a $Soil_i$ RS based on an analytical quantitation limit, a Department-approved background level, or the 10,000 mg/kg cap. It should be noted that the sum of residual TPH fraction concentrations remaining in soil shall not exceed 10,000 mg/kg.

Table D-1

Indicator Compounds, Hydrocarbon Fractions[1] and Hydrocarbon Mixtures

Indicator Compound	gasoline	jet fuel [2] (JP-8)	kerosene	Diesel, light fuel oils	heavy fuel oils	crude oil	highly refined base oils (hydraulic fluid)[3]	used motor oil, lubricating oil	unknown
Benzene	X								X
Toluene	X								X
Ethylbenzene	X								X
Xylene	X								X
Acenaphthene				X	X	X		X	X
Acenaphthylene				X	X	X		X	X
Anthracene				X	X	X		X	X
Benzo(a)pyrene				X	X	X		X	X
Chrysene				X	X	X		X	X
Dibenz(a,h)anthracene				X	X	X		X	X
Indeno(1,2,3-cd)pyrene				X	X	X		X	X
Benzo(k)fluoranthene				X	X	X		X	X
Benzo(b)fluoranthene				X	X	X		X	X
Benzo(a)anthracene				X	X	X		X	X
Fluoranthene				X	X	X		X	X
Fluorene				X	X	X		X	X
Naphthalene				X	X	X		X	X
2-Methylnaphthalene				X	X	X		X	X
Phenanthrene				X	X	X		X	X
Pyrene				X	X	X		X	X
Lead (inorganic)	X[4]								X[4]
Metals								X	
Methyl tertbutyl ether	X[4]								X[4]
Methyl ethyl ketone	X[4]								X[4]
Methyl isobutyl ketone	X[4]								X[4]
Aliphatics $C_{>6}$ - C_8	X[5]	X	X[7]			X[6]			X[6]
Aliphatics $C_{>8}$ - C_{10}	X[5]	X	X[7]			X[6]			X[6]
Aliphatics $C_{>10}$ - C_{12}		X	X[7]	X[8]		X[6]			X[6]
Aliphatics $C_{>12}$ - C_{16}		X	X[7]	X[8]		X[6]	X[9]		X[6]
Aliphatics $C_{>16}$ - C_{35}		X		X[8]	X[9]	X[6]	X[6]	X[10]	X[6]
Aromatics $C_{>8}$ - C_{10}	X[5]	X	X[7]			X[6]			X[6]
Aromatics $C_{>10}$ - C_{12}		X	X[7]	X[8]		X[6]			X[6]
Aromatics $C_{>12}$ - C_{16}		X	X[7]	X[8]		X[6]	X[6]		X[6]
Aromatics $C_{>16}$ - C_{21}		X		X[8]	X[9]	X[6]	X[6]		X[6]
Aromatics $C_{>21}$ - C_{35}		X			X[9]	X[6]	X[6]	X[10]	X[6]
TPH–GRO $C_6 – C_{10}$	X[11]	X[6]	X[11]			X[11]			X[6]
TPH–DRO $C_{10} – C_{28}$ [12]		X[6]	X[13]	X[13]	X[13]	X[13]	X[13]		X[6]
TPH–ORO $C_{>28}$ [12]		X[6]			X[14]	X[14]	X[14]	X[14]	X[6]

[1]ASTM (1995) and TPH Criteria Working Group (1998); under certain site-specific conditions, the Department may require that additional indicator constituents be identified for evaluation; for petroleum mixtures not identified in Table D-1, indicator compounds and hydrocarbon ranges shall be identified by the Submitter and approved by the Department.

[2]For JP-7 (C_{10}-C_{17}), the hydrocarbon fractions shall include aliphatic and aromatic $C_{>8}$-C_{10}, $C_{>10}$-C_{12}, $C_{>12}$-C_{16}, and $C_{>16}$-C_{35}. For JP-5, the indicator compounds shall include benzene, toluene, ethylbenzene, and xylene and the hydrocarbon fractions shall include aliphatic and aromatic $C_{>8}$-C_{10}, $C_{>10}$-C_{12}, $C_{>12}$-C_{16}, and $C_{>16}$-C_{35}.

[3]Applies to oils formulated with highly refined base oils including hydraulic fluids (Mineral-oil based hydraulic fluids, *Toxicological Profile for Mineral Oil Hydraulic Fluids, Organophosphate Ester Hydraulic Fluids, and Polyalphaolefin Hydraulic Fluids*, ATSDR 1994), motor oils, industrial oils, and automatic transmission fluid-type oils (i.e., severely refined base oils).

[4]When suspected to be present.

[5]TPH-GRO may be used instead of Aliphatics $C_{>6}$ - C_8, Aliphatics $C_{>8}$ - C_{10}, and Aromatics $C_{>8}$ - C_{10}.

[6]TPH-GRO, TPH-DRO, and TPH-ORO may be used instead of Aliphatics $C_{>6}$ - C_8, Aliphatics $C_{>8}$ - C_{10}, Aliphatics $C_{>10}$ – C_{12}, Aliphatics $C_{>12}$ - C_{16}, Aliphatics $C_{>16}$ – C_{35}, Aromatics $C_{>8}$ - C_{10}, Aromatics $C_{>10}$ - C_{12}, Aromatics $C_{>12}$ - C_{16}, Aromatics $C_{>16}$ – C_{21}, and Aromatics $C_{>21}$ – C_{35}.

[7]TPH-GRO and TPH-DRO may be used instead of Aliphatics $C_{>6}$ - C_8, Aliphatics $C_{>8}$ - C_{10}, Aliphatics $C_{>10}$ – C_{12}, Aliphatics $C_{>12}$ - C_{16}, Aliphatics $C_{>16}$ – C_{35}, Aromatics $C_{>8}$ - C_{10}, Aromatics $C_{>10}$ - C_{12}, Aromatics $C_{>12}$ - C_{16}, Aromatics $C_{>16}$ – C_{21}, and Aromatics $C_{>21}$ – C_{35}.

[8]TPH-DRO may be used instead of Aliphatics $C_{>10}$ – C_{12}, Aliphatics $C_{>12}$ - C_{16}, Aliphatics $C_{>16}$ – C_{35}, Aromatics $C_{>10}$ - C_{12}, Aromatics $C_{>12}$ - C_{16}, Aromatics $C_{>16}$ – C_{21}, and Aromatics $C_{>21}$ – C_{35}.

[9]TPH-DRO and TPH-ORO may be used instead of Aliphatics $C_{>10}$ – C_{12}, Aliphatics $C_{>12}$ - C_{16}, Aliphatics $C_{>16}$ – C_{35}, Aromatics $C_{>10}$ - C_{12}, Aromatics $C_{>12}$ - C_{16}, Aromatics $C_{>16}$ – C_{21}, and Aromatics $C_{>21}$ – C_{35}.

[10]TPH-ORO may be used instead of Aliphatics $C_{>16}$ – C_{35} and Aromatics $C_{>21}$ – C_{35}.

[11]Aliphatics $C_{>6}$ - C_8, Aliphatics $C_{>8}$ - C_{10}, and Aromatics $C_{>8}$ - C_{10} may be used instead of TPH-GRO.

[12]Extractable.

[13]Aliphatics $C_{>10}$ – C_{12}, Aliphatics $C_{>12}$ - C_{16}, Aliphatics $C_{>16}$ – C_{35}, Aromatics $C_{>10}$ - C_{12}, Aromatics $C_{>12}$ - C_{16}, Aromatics $C_{>16}$ – C_{21}, and Aromatics $C_{>21}$ – C_{35} may be used instead of TPH-DRO.

[14]Aliphatics $C_{>16}$ – C_{35} and Aromatics $C_{>21}$ – C_{35} may be used instead of TPH-ORO.

Table D-2
Physical/Chemical Properties for Hydrocarbon Fractions [1]

Fraction	Boiling Point (°C)	Molecular Weight (g/mole)	Solubility (mg/l)	Vapor Pressure (atm)	Henry's Law Constant (cm^3/cm^3)	log Koc (ml/g)
C_5-C_6 Aliphatics	5.1E+01	8.1E+01	3.6E+01	3.5E-01	3.3E+01	2.9E+00
$C_{>6}$-C_8 Aliphatics	9.6E+01	1.0E+02	5.4E+00	6.3E-02	5.0E+01	3.6E+00
$C_{>8}$-C_{10} Aliphatics	1.5E+02	1.3E+02	4.3E-01	6.3E-03	8.0E+01	4.5E+00
$C_{>10}$-C_{12} Aliphatics	2.0E+02	1.6E+02	3.4E-02	6.3E-04	1.2E+02	5.4E+00
$C_{>12}$-C_{16} Aliphatics	2.6E+02	2.0E+02	7.6E-04	4.8E-05	5.2E+02	6.7E+00
$C_{>16}$-C_{21} Aliphatics	3.2E+02	2.7E+02	1.3E-06	1.1E-06	4.9E+03	8.8E+00
$C_{>8}$-C_{10} Aromatics	1.5E+02	1.2E+02	6.5E+01	6.3E-03	4.8E-01	3.2E+00
$C_{>10}$-C_{12} Aromatics	2.0E+02	1.3E+02	2.5E+01	6.3E-04	1.4E-01	3.4E+00
$C_{>12}$-C_{16} Aromatics	2.6E+02	1.5E+02	5.8E+00	4.8E-05	5.3E-02	3.7E+00
$C_{>16}$-C_{21} Aromatics	3.2E+02	1.9E+02	6.5E-01	1.1E-06	1.3E-02	4.2E+00
$C_{>21}$-C_{35} Aromatics	3.4E+02	2.4E+02	6.6E-03	4.4E-10	6.7E-04	5.1E+00

[1]TPH Criteria Working Group, 1997a.

Table D-3 [1]

Petroleum Hydrocarbon Fraction-Specific Chronic Reference Doses

Carbon Range[2]	Oral RfD (mg/kg-day)	Inhalation RfD (mg/kg-day)	Target Organ/ Critical Effect
Aliphatics $C_{>6}$-C_8 [3]	5.0	5.3	kidney
Aliphatics $C_{>8}$-C_{16}	0.1	0.3	liver, hematological system
Aliphatics $C_{>16}$-C_{35}	2.0	NA [4]	liver
Aromatics $C_{>8}$-C_{16}	0.04	0.06	decreased body weight
Aromatics $C_{>16}$-C_{35}	0.03	NA	kidney

[1]TPHCWG, 1997b.

[2]Equivalent carbon number range as defined in TPHCWG, 1997a.

[3]If the n-hexane concentration is < 53% (as in commercial hexane) a RfD of 5.0 mg/kg-d shall be used. If the n-hexane concentration is > 53%, a composition-weighted RfD shall be developed using 0.06 mg/kg-d for the n-hexane portion and 2.0 mg/kg-d for the remainder of the mass.

[4]NA = Not Available.

Table D-4

Critical Effects for the Assessment of Additive Health Effects for Petroleum Hydrocarbon Releases [1]

CONSTITUENT	CAS #	TARGET ORGAN(S)/CRITICAL EFFECT(S) [2]
Gasoline:		
Benzene	71-43-2	Bone marrow toxicity (lymphocytopenia) [3]
Ethyl benzene	100-41-4	Liver toxicity; Kidney toxicity; Fetal effects (skeletal abnormalities)
Toluene	108-88-3	Liver effects (change in weight); Kidney effects (change in weight); Central nervous system effects (decreased concentration-response relationship); Nasal cavity (degeneration of epithelium)
Xylene (mixed)	1330-20-7	Central nervous system effects (impaired motor coordination); Decreased body weight; Increased mortality
Aliphatics C_6-C_8	NA[4]	Kidney effects
Aliphatics $C_{>8}$-C_{16}	NA	Liver effects; Hematological system effects
Aromatics $C_{>8}$-C_{16}	NA	Decreased body weight
TPH-GRO	NA	Kidney effects; Liver effects; Hematological system effects; Decreased body weight
Diesel:		
Acenaphthene	83-32-9	Liver toxicity
Anthracene	120-12-7	No observed effects
Fluoranthene	206-44-0	Kidney effects; Liver effects
Fluorene	86-73-7	Hematological effects
Naphthalene	91-20-3	Decreased body weight; Nasal cavity effects
Pyrene	129-00-0	Kidney effects
Aliphatics $C_{>8}$-C_{16}	NA	Liver effects; Hematological system effects
Aliphatics $C_{>16}$-C_{35}	NA	Liver effects
Aromatics $C_{>8}$-C_{16}	NA	Decreased body weight
Aromatics $C_{>16}$-C_{35}	NA	Kidney effects
TPH-DRO	NA	Kidney effects; Liver effects; Hematological system effects; Decreased body weight
Oil (used motor oil, lubricating oil):		
Acenaphthene	83-32-9	Liver toxicity
Anthracene	120-12-7	No observed effects
Fluoranthene	206-44-0	Kidney effects; Liver effects
Fluorene	86-73-7	Hematological effects
Naphthalene	91-20-3	Decreased body weight; Nasal cavity effects
Pyrene	129-00-0	Kidney effects
Aliphatics $C_{>16}$-C_{35}	NA	Liver effects
Aromatics $C_{>16}$-C_{35}	NA	Kidney effects
TPH-ORO	NA	Kidney effects; Liver effects
Additives:		
Methyl ethyl ketone	78-93-3	Fetal effects (decreased birth weight)
Methyl isobutyl ketone	108-10-1	NA
MTBE (methyl tert-butyl ether)	1634-04-4	Liver effects; Kidney; Ocular effects

[1]Data were obtained from EPA's Integrated Risk Information System and Health Effects Assessment Summary Tables; includes target organs/critical effects for the ingestion and inhalation routes of exposure (where available).

[2]The target organs/critical effects on which the reference dose(s) is based.

[3]NCEA; RAIS June 2003.

[4]Not applicable or not available.

References

American Society for Testing and Materials. 1995. Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites. Designation ASTM E 1739 -95.

Total Petroleum Hydrocarbon Criteria Working Group Series (Potter, Thomas and Simmons, Katherine) 1998. Volume 2 Composition of Petroleum Mixtures (http://www.aehs.com/)

Total Petroleum Hydrocarbon Criteria Working Group Series, (John B. Gustafson, Ph.D.; Joan Griffith Tell, Ph.D. and Doug Orem). 1997a. Volume 3 Selection of Representative TPH Fractions Based on Fate and Transport Considerations (http://www.aehs.com/)

Total Petroleum Hydrocarbon Criteria Working Group Series (D.A. Edwards, Ph.D.; M.D. Andriot, Ph.D.; M.A. Amoruso, Ph.D.; A.C. Tummey; C.J. Bevan, Ph.D.; A. Tveit, Ph.D.; L.A. Hayes, MS, MLS; S.H. Youngren, Ph.D.; and D.V. Nakles, Ph.D.) 1997b. Volume 4 Development of Fraction Specific Reference Doses (RfD) and Reference Concentrations (RfC) for Total Petroleum Hydrocarbons (TPH) (http://www.aehs.com/)

Total Petroleum Hydrocarbon Criteria Working Group Series (Vorhees, Donna and Weisman, Wade) 1997c. Volume 5 Human Health Risk-Based Evaluation of Petroleum Contaminated Sites: Implementation of the Working Group Approach (http://www.aehs.com/)

POLYCYCLIC AROMATIC HYDROCARBONS

GUIDELINES FOR ASSESSING POLYCYCLIC AROMATIC HYDROCARBONS

Carcinogens. Seven Polycyclic Aromatic Hydrocarbons (PAH) constituents have been assigned weight of evidence judgments of Group B2, probable human carcinogen. These constituents include benzo[a]pyrene, benz[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene. A cancer slope factor is currently available only for benzo[a]pyrene. The remaining carcinogenic PAH shall be assessed using cancer slope factors developed based on their respective "estimated order of potential potency" relative to the potency of benzo[a]pyrene. These relative potencies should be applied only to the assessment of carcinogenic hazards associated with the ingestion of PAH (*Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*, EPA 1993).

Constituent	Relative Potency[1]	Oral Slope Factor[2] (mg/kg-day)	Inhalation Slope Factor[2] $(mg/kg\text{-}day)^{-1}$
benzo[a]pyrene	1.0	7.3E-00	3.1E+00
benz[a]anthracene	0.1	7.3E-01	3.1E-01
benzo[b]fluoranthene	0.1	7.3E-01	3.1E-01
benzo[k]fluoranthene	0.01	7.3E-02	3.1E-02
chrysene	0.001	7.3E-03	3.1E-03
dibenz[a,h]anthracene	1.0	7.3E-00	3.1E+00
indeno[1,2,3-cd]pyrene	0.1	7.3E-01	3.1E-01

[1]*Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*, EPA 1993.
[2]*EPA Region 6 Human Health Medium-Specific Screening Levels.*

Noncarcinogens. Surrogate RfD have been assigned to the following noncarcinogenic PAH constituents based on similarities in chemical structure and physiological activity:

Constituent	RfD_o	RfD_i	Reference	Surrogate
acenaphthylene	6E-02	NA[1]	IRIS[2]	acenaphthene
2-methylnaphthalene	2E-02	8.6E-04	IRIS	naphthalene
phenanthrene	3E-01	NA	IRIS	anthracene

[1]Not available.
[2]Integrated Risk Information System, EPA.

LEAD

GUIDELINES FOR ASSESSING INORGANIC LEAD

Health risks associated with exposure to inorganic lead are not assessed using the traditional risk assessment methodology based on the use of toxicity values (RfD, RfC, SF). Rather, lead exposure is assessed using the Integrated Exposure Uptake Biokinetic Model (IEUBK) (pub. #9285.7-15-2, PB93-963511) or the Adult Lead Cleanup Level Model.

The IEUBK model is a pharmacokinetic model that integrates exposure from lead in air, water, soil, dust, diet, and paint. This model estimates blood lead levels associated with exposure under a residential scenario (child receptor) to determine an acceptable soil lead concentration for residential land use. Using standard EPA default parameters recommended in the Guidance Manual for IEUBK Model for Lead in Children (EPA 1994), the resulting soil concentration for lead is 400 mg/kg for a residential land use scenario. According to EPA guidance, it is expected that a soil lead concentration of 400 mg/kg will limit the probability that blood lead levels will exceed 10 ug/dl to no more than 5 percent for a child receptor under a residential exposure scenario. In accordance with EPA guidelines, the MO-1 and MO-2 risk-based $Soil_{ni}$ for lead has been set at 400 mg/kg. The value of 400 mg/kg is based on an assumed outdoor air concentration of 0.10 ug/m^3 and a drinking water concentration of 4 ug/l (EPA 1994). The final non-industrial RS applied at the AOI shall consider $Soil_{GW}$ and $Soil_{sat}$.

For non-industrial land use scenarios, lead exposure should be assessed using the Adult Lead Model in accordance with *Recommendations for the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil* (TRWR; EPA 1996). This model focuses on estimating fetal blood lead concentrations in pregnant women exposed to lead contaminated soils in a commercial/industrial setting. In accordance with EPA guidelines, the Adult Lead Model and standard EPA default parameters recommended by EPA Region VI were used to develop the SO $Soil_{SSi}$, MO-1 $Soil_i$, and MO-2 $Soil_i$ of 1,400 mg/kg for lead. The final industrial RS applied at the AOI shall consider $Soil_{GW}$ and $Soil_{sat}$. The adult lead model and default assumptions are presented below.

Site-specific exposure data may used under MO-3 for the assessment of lead exposure for residential and industrial land use scenarios. Under MO-2, site specific data may be used for the exposure concentration model inputs for air, drinking water, and soil/dust. In the absence of site-specific data, EPA default values shall be used.

Adult Lead Exposure Model [1] - Commercial/Industrial Land Use

$$Soil_i(\mu g/g) = \frac{(PbB_{95}\ fetal / (R\ x (GSD_i)^{1.645})) - PbB0}{BKSF\ x\ ((IR_s\ x\ AF_s\ x\ EF_s / 365) + (K_{sd}\ x\ IR_d\ x\ AF_d\ x\ EF_d / 365))}$$		
Parameter	**Definition (units)**	**Default [2]**
PbB_{95} fetal	95th Percentile PbB in Fetus (µg/dL)	10
R	Mean Ratio of Fetal to Maternal PbB	0.9
GSD_i	Individual Geometric Standard Deviation	1.8
PbB0	Baseline Blood Lead Value (µg/dL)	2.0
BKSF	Biokinetic Slope Factor (µg/dL per µg/day)	0.4
IR_s	Soil Ingestion Rate (g/day)	0.05
IR_d	Dust Ingestion Rate (g/day)	0
K_{sd}	Ratio of Concentration in Dust to that in Soil	0.7
EF_s	Soil Exposure Frequency (days/yr)	219
EF_d	Dust Exposure Frequency (days/yr)	219
AF_s	Absolute Absorption Fraction of Lead in Soil	0.12
AF_d	Absolute Absorption Fraction of Lead in Dust	0.12

[1] *Recommendations for the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil* (TRWR; EPA 1996).
[2] EPA Region VI, 2003.

POLYCHLORINATED DIBENZODIOXINS AND DIBENZOFURANS

GUIDELINES FOR ASSESSING POLYCHLORINATED DIBENZODIOXINS AND DIBENZOFURANS

Polychlorinated dibenzodioxins (PCDD) and dibenzofurans (PCDF) shall be evaluated using Toxic Equivalency Factors (TEF) that indicate an order of magnitude estimate of the toxicity of a specific congener relative to the most toxic congener, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The TEF values in combination with site characterization data shall be used to calculate a toxic equivalent concentration (TEQ) in each medium of concern using the equation and TEF values presented below. The TEQ for each medium shall be compared to the SS or RS for TCDD.

$$TEQ = \sum_{n1} [PCDD_i \text{ x } TEF_i] + \sum_{n2} [PCDF_i \text{ x } TEF_i].$$

where:

Parameter	**Definition**
TEQ	Toxic equivalent concentration
PCDD	Concentration of PCDD congener in medium
PCDF	Concentration of PCDF in congener in medium
TEF	Congener-specific toxic equivalent factor

The TEF that shall be used to calculate the TEQ are as follows:

Congener	**TEF** [1]
Dioxins	
2,3,7,8-TCDD	1
1,2,3,7,8-PentaCDD	0.1
1,2,3,4,7,8-HexaCDD	0.1
1,2,3,6,7,8-HexaCDD	0.1
1,2,3,7,8,9-HexaCDD	0.1
1,2,3,4,6,7,8-HeptaCDD	0.01
OctaCDD	0.0001
Furans	
2,3,7,8-TetraCDF	0.1
1,2,3,7,8-PentaCDF	0.05
2,3,4,7,8-PentaCDF	0.5
1,2,3,4,7,8-HexaCDF	0.1
1,2,3,6,7,8-HexaCDF	0.1
1,2,3,7,8,9-HexaCDF	0.1
2,3,4,6,7,8-HexaCDF	0.1
1,2,3,4,6,7,8-HeptaCDF	0.01
1,2,3,4,7,8,9-HeptaCDF	0.01
OctaCDF	0.0001

[1] *Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife*. Van den Berg, Martin, et.al. Environmental Health Perspectives, Volume 106; Number 12, December 1998; Federal Register, May 18, 2000, Volume 65, Number 97, Page 31696.

NON-TRADITIONAL PARAMETERS

NON-TRADITIONAL PARAMETERS

Non-traditional parameters include those constituents or physical/chemical parameters (e.g. chlorides, sulfates, pH, temperature, etc.) for which toxicity data are not available and thus cannot be evaluated using traditional risk assessment/RECAP methods. Non-traditional parameters shall be evaluated under MO-2 or MO-3. RS for these constituents (or physical/chemical parameters) shall consider, where appropriate and feasible, protection of human health, ecological receptors, livestock, crops, and vegetation; prevention of constituent migration and cross-media transfer; protection of beneficial uses of the medium of concern; protection of above ground and subsurface structures; and protection of resource aesthetics. Where appropriate, an environmental fate and transport analysis may be required by the Department to evaluate potential future impacts to health and/or the environment. An ecological checklist (RECAP Form 18) shall be completed to evaluate the need for an ecological risk assessment.

The evaluation of these parameters is highly dependent on professional judgement and all proposed RS shall be subject to Department approval. It is recommended that a workplan be submitted to the Department for approval prior to managing an AOI impacted by a non-traditional constituent or other parameter that may produce adverse environmental effects. A RS proposed for a non-traditional parameter shall be accompanied by appropriate supporting documentation and references. A RS for a non-traditional parameter shall not result in soil that exhibits hazardous waste characteristics of ignitability, corrosivity, or reactivity as defined in the Hazardous Waste Regulations (LAC 33:V). Prior to the development and application of a RS for a non-traditional parameter, the impacted medium under investigation shall be in declining conditions (i.e., the constituent mass is not increasing, the source of the release has been mitigated, and the area of constituent concentrations likely to be of concern is not expanding).

Non-traditional parameters shall be evaluated in accordance with the guidelines presented below as may be applicable.

1. Identify all available Applicable or Relevant and Appropriate Requirements (ARAR) (e.g., secondary MCL). Of the available ARAR, select the ARAR that is most appropriate for the evaluation of site-specific conditions and health and environmental concerns identified at the AOI. Where appropriate, consider the beneficial use of the medium of concern (e.g., groundwater used for irrigation);

2. Consider the protection of resource aesthetics (i.e., soil saturation level, water solubility, odor thresholds, taste, visual, etc.);

3. Consider all environmental fate and transport pathways especially those relating to exposure to human or ecological receptors and constituent migration and cross-media transfer;

4. Consider protection of vegetation (e.g., native surface cover) and/or the ability to grow crops;

5. Consider the Department-approved background concentration in accordance with Section 2.13 (e.g., for the evaluation of cross-media transfer, the naturally-occurring background chloride concentration of a receiving surface water body may be used as the SS or RS for the evaluation of chloride in a Groundwater 3 zone);

6. Based on the information obtained in steps 1, 2, 3, 4, and 5 identify a RS that adequately addresses the health and/or environmental concerns at the AOI;

7. Determine the AOIC or CC in accordance with Section 2.8; and

8. Compare the AOIC to the RS:

   If the AOIC is less than or equal to the RS, then typically no further action at this time shall be required for the medium of concern.

   If the AOIC is greater than the RS, then the AOI shall be further evaluated under a higher tier or the medium of concern shall be remediated to the RS.

If the SS or RS is less than the analytical quantitation limit, then a Department-approved quantitation limit shall serve as the SS or RS.

APPENDIX E

NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM CODES AND TITLES

The North American Industry Classification System (NAICS) Codes are identified by a 6-digit code. The first two digits designate a major Economic Sector. The third digit designates an Economic subsector. The fourth digit designates an Industry Group. The fifth digit designates the NAICS Industry. The sixth digit, where used, identifies subdivisions of the NAICS industries. For more information on the NAICS refer to http://www.ntis.gov/yellow/1nty205.htm.

1997 U.S. NAICS Codes and Titles
July 1998

Not shown here are 6-digit codes ending in 0 that coincide with their parent 5-digit category, for example, 111110 Soybean Farming.

NAICS Code	U.S. NAICS Description

11 AGRICULTURE, FORESTRY, FISHING AND HUNTING

111 Crop Production

1111	Oilseed and Grain Farming
11111	Soybean Farming
11112	Oilseed (except Soybean) Farming
11113	Dry Pea and Bean Farming
11114	Wheat Farming
11115	Corn Farming
11116	Rice Farming
11119	Other Grain Farming
111191	Oilseed and Grain Combination Farming
111199	All Other Grain Farming
1112	Vegetable and Melon Farming
11121	Vegetable and Melon Farming
111211	Potato Farming
111219	Other Vegetable (except Potato) and Melon Farming
1113	Fruit and Tree Nut Farming
11131	Orange Groves
11132	Citrus (except Orange) Groves
11133	Noncitrus Fruit and Tree Nut Farming
111331	Apple Orchards
111332	Grape Vineyards
111333	Strawberry Farming
111334	Berry (except Strawberry) Farming
111335	Tree Nut Farming
111336	Fruit and Tree Nut Combination Farming
111339	Other Noncitrus Fruit Farming
1114	Greenhouse, Nursery, and Floriculture Production
11141	Food Crops Grown Under Cover
111411	Mushroom Production
111419	Other Food Crops Grown Under Cover
11142	Nursery and Floriculture Production
111421	Nursery and Tree Production
111422	Floriculture Production
1119	Other Crop Farming
11191	Tobacco Farming
11192	Cotton Farming
11193	Sugarcane Farming
11194	Hay Farming
11199	All Other Crop Farming
111991	Sugar Beet Farming
111992	Peanut Farming
111998	All Other Miscellaneous Crop Farming

112 Animal Production

1121	Cattle Ranching and Farming
11211	Beef Cattle Ranching and Farming, including Feedlots
112111	Beef Cattle Ranching and Farming
112112	Cattle Feedlots
11212	Dairy Cattle and Milk Production
11213	Dual Purpose Cattle Ranching and Farming
1122	Hog and Pig Farming
11221	Hog and Pig Farming
1123	Poultry and Egg Production
11231	Chicken Egg Production
11232	Broilers and Other Meat Type Chicken Production
11233	Turkey Production
11234	Poultry Hatcheries
11239	Other Poultry Production
1124	Sheep and Goat Farming
11241	Sheep Farming
11242	Goat Farming
1125	Animal Aquaculture
11251	Animal Aquaculture
112511	Finfish Farming and Fish Hatcheries
112512	Shellfish Farming
112519	Other Animal Aquaculture
1129	Other Animal Production
11291	Apiculture
11292	Horse and Other Equine Production
11293	Fur-Bearing Animal and Rabbit Production
11299	All Other Animal Production

113 Forestry and Logging

1131	Timber Tract Operations
11311	Timber Tract Operations
1132	Forest Nurseries and Gathering of Forest Products
11321	Forest Nurseries and Gathering of Forest Products
1133	Logging
11331	Logging

114 Fishing, Hunting and Trapping

1141	Fishing
11411	Fishing
114111	Finfish Fishing
114112	Shellfish Fishing
114119	Other Marine Fishing
1142	Hunting and Trapping
11421	Hunting and Trapping

115 Support Activities for Agriculture and Forestry

1151	Support Activities for Crop Production
11511	Support Activities for Crop Production
115111	Cotton Ginning
115112	Soil Preparation, Planting, and Cultivating
115113	Crop Harvesting, Primarily by Machine
115114	Postharvest Crop Activities (except Cotton Ginning)
115115	Farm Labor Contractors and Crew Leaders
115116	Farm Management Services
1152	Support Activities for Animal Production
11521	Support Activities for Animal Production
1153	Support Activities for Forestry
11531	Support Activities for Forestry

21 MINING

211 Oil and Gas Extraction

2111	Oil and Gas Extraction
21111	Oil and Gas Extraction
211111	Crude Petroleum and Natural Gas Extraction
211112	Natural Gas Liquid Extraction

212 Mining (except Oil and Gas)

2121	Coal Mining
21211	Coal Mining
212111	Bituminous Coal and Lignite Surface Mining
212112	Bituminous Coal Underground Mining
212113	Anthracite Mining
2122	Metal Ore Mining
21221	Iron Ore Mining
21222	Gold Ore and Silver Ore Mining
212221	Gold Ore Mining
212222	Silver Ore Mining
21223	Copper, Nickel, Lead, and Zinc Mining
212231	Lead Ore and Zinc Ore Mining
212234	Copper Ore and Nickel Ore Mining
21229	Other Metal Ore Mining
212291	Uranium-Radium-Vanadium Ore Mining
212299	All Other Metal Ore Mining
2123	Nonmetallic Mineral Mining and Quarrying
21231	Stone Mining and Quarrying
212311	Dimension Stone Mining and Quarrying
212312	Crushed and Broken Limestone Mining and Quarrying
212313	Crushed and Broken Granite Mining and Quarrying
212319	Other Crushed and Broken Stone Mining and Quarrying
21232	Sand, Gravel, Clay, and Ceramic and Refractory Minerals Mining and Quarrying
212321	Construction Sand and Gravel Mining
212322	Industrial Sand Mining
212324	Kaolin and Ball Clay Mining
212325	Clay and Ceramic and Refractory Minerals Mining
21239	Other Nonmetallic Mineral Mining and Quarrying
212391	Potash, Soda, and Borate Mineral Mining
212392	Phosphate Rock Mining
212393	Other Chemical and Fertilizer Mineral Mining
212399	All Other Nonmetallic Mineral Mining

213 Support Activities for Mining

2131	Support Activities for Mining
21311	Support Activities for Mining
213111	Drilling Oil and Gas Wells
213112	Support Activities for Oil and Gas Operations
213113	Support Activities for Coal Mining
213114	Support Activities for Metal Mining
213115	Support Activities for Nonmetallic Minerals (except Fuels)

22 UTILITIES

221 Utilities

2211	Electric Power Generation, Transmission and Distribution
22111	Electric Power Generation
221111	Hydroelectric Power Generation
221112	Fossil Fuel Electric Power Generation
221113	Nuclear Electric Power Generation
221119	Other Electric Power Generation
22112	Electric Power Transmission, Control, and Distribution
221121	Electric Bulk Power Transmission and Control
221122	Electric Power Distribution
2212	Natural Gas Distribution
22121	Natural Gas Distribution
2213	Water, Sewage and Other Systems
22131	Water Supply and Irrigation Systems
22132	Sewage Treatment Facilities
22133	Steam and Air-Conditioning Supply

23 CONSTRUCTION

233 Building, Developing, and General Contracting

2331	Land Subdivision and Land Development
23311	Land Subdivision and Land Development
2332	Residential Building Construction
23321	Single Family Housing Construction
23322	Multifamily Housing Construction
2333	Nonresidential Building Construction
23331	Manufacturing and Industrial Building Construction
23332	Commercial and Institutional Building Construction

234 Heavy Construction

2341	Highway, Street, Bridge, and Tunnel Construction
23411	Highway and Street Construction
23412	Bridge and Tunnel Construction
2349	Other Heavy Construction
23491	Water, Sewer, and Pipeline Construction
23492	Power and Communication Transmission Line Construction
23493	Industrial Nonbuilding Structure Construction
23499	All Other Heavy Construction

235 Special Trade Contractors

2351	Plumbing, Heating, and Air-Conditioning Contractors
23511	Plumbing, Heating, and Air-Conditioning Contractors
2352	Painting and Wall Covering Contractors
23521	Painting and Wall Covering Contractors
2353	Electrical Contractors
23531	Electrical Contractors
2354	Masonry, Drywall, Insulation, and Tile Contractors
23541	Masonry and Stone Contractors
23542	Drywall, Plastering, Acoustical, and Insulation Contractors
23543	Tile, Marble, Terrazzo, and Mosaic Contractors
2355	Carpentry and Floor Contractors
23551	Carpentry Contractors
23552	Floor Laying and Other Floor Contractors
2356	Roofing, Siding, and Sheet Metal Contractors
23561	Roofing, Siding, and Sheet Metal Contractors
2357	Concrete Contractors
23571	Concrete Contractors
2358	Water Well Drilling Contractors
23581	Water Well Drilling Contractors
2359	Other Special Trade Contractors
23591	Structural Steel Erection Contractors
23592	Glass and Glazing Contractors
23593	Excavation Contractors
23594	Wrecking and Demolition Contractors
23595	Building Equipment and Other Machinery Installation Contractors
23599	All Other Special Trade Contractors

31-33 MANUFACTURING

311 Food Manufacturing

3111	Animal Food Manufacturing
31111	Animal Food Manufacturing
311111	Dog and Cat Food Manufacturing
311119	Other Animal Food Manufacturing
3112	Grain and Oilseed Milling
31121	Flour Milling and Malt Manufacturing
311211	Flour Milling
311212	Rice Milling
311213	Malt Manufacturing
31122	Starch and Vegetable Fats and Oils Manufacturing
311221	Wet Corn Milling
311222	Soybean Processing
311223	Other Oilseed Processing
311225	Fats and Oils Refining and Blending
31123	Breakfast Cereal Manufacturing
3113	Sugar and Confectionery Product Manufacturing
31131	Sugar Manufacturing
311311	Sugarcane Mills
311312	Cane Sugar Refining
311313	Beet Sugar Manufacturing
31132	Chocolate and Confectionery Manufacturing from Cacao Beans
31133	Confectionery Manufacturing from Purchased Chocolate
31134	Nonchocolate Confectionery Manufacturing
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing
31141	Frozen Food Manufacturing
311411	Frozen Fruit, Juice, and Vegetable Manufacturing
311412	Frozen Specialty Food Manufacturing
31142	Fruit and Vegetable Canning, Pickling, and Drying
311421	Fruit and Vegetable Canning
311422	Specialty Canning
311423	Dried and Dehydrated Food Manufacturing
3115	Dairy Product Manufacturing
31151	Dairy Product (except Frozen) Manufacturing
311511	Fluid Milk Manufacturing

311512	Creamery Butter Manufacturing
311513	Cheese Manufacturing
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing
31152	Ice Cream and Frozen Dessert Manufacturing
3116	Animal Slaughtering and Processing
31161	Animal Slaughtering and Processing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311615	Poultry Processing
3117	Seafood Product Preparation and Packaging
31171	Seafood Product Preparation and Packaging
311711	Seafood Canning
311712	Fresh and Frozen Seafood Processing
3118	Bakeries and Tortilla Manufacturing
31181	Bread and Bakery Product Manufacturing
311811	Retail Bakeries
311812	Commercial Bakeries
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing
31182	Cookie, Cracker, and Pasta Manufacturing
311821	Cookie and Cracker Manufacturing
311822	Flour Mixes and Dough Manufacturing from Purchased Flour
311823	Dry Pasta Manufacturing
31183	Tortilla Manufacturing
3119	Other Food Manufacturing
31191	Snack Food Manufacturing
311911	Roasted Nuts and Peanut Butter Manufacturing
311919	Other Snack Food Manufacturing
31192	Coffee and Tea Manufacturing
31193	Flavoring Syrup and Concentrate Manufacturing
31194	Seasoning and Dressing Manufacturing
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing
311942	Spice and Extract Manufacturing
31199	All Other Food Manufacturing
311991	Perishable Prepared Food Manufacturing
311999	All Other Miscellaneous Food Manufacturing

312 Beverage and Tobacco Product Manufacturing

3121	Beverage Manufacturing
31211	Soft Drink and Ice Manufacturing
312111	Soft Drink Manufacturing
312112	Bottled Water Manufacturing
312113	Ice Manufacturing
31212	Breweries
31213	Wineries
31214	Distilleries
3122	Tobacco Manufacturing
31221	Tobacco Stemming and Redrying
31222	Tobacco Product Manufacturing
312221	Cigarette Manufacturing
312229	Other Tobacco Product Manufacturing

313 Textile Mills

3131	Fiber, Yarn, and Thread Mills
31311	Fiber, Yarn, and Thread Mills
313111	Yarn Spinning Mills
313112	Yarn Texturizing, Throwing, and Twisting Mills
313113	Thread Mills
3132	Fabric Mills
31321	Broadwoven Fabric Mills
31322	Narrow Fabric Mills and Schiffli Machine Embroidery
313221	Narrow Fabric Mills
313222	Schiffli Machine Embroidery
31323	Nonwoven Fabric Mills
31324	Knit Fabric Mills
313241	Weft Knit Fabric Mills
313249	Other Knit Fabric and Lace Mills
3133	Textile and Fabric Finishing and Fabric Coating Mills
31331	Textile and Fabric Finishing Mills
313311	Broadwoven Fabric Finishing Mills
313312	Textile and Fabric Finishing (except Broadwoven Fabric) Mills
31332	Fabric Coating Mills

314 Textile Product Mills

3141	Textile Furnishings Mills
31411	Carpet and Rug Mills
31412	Curtain and Linen Mills
314121	Curtain and Drapery Mills
314129	Other Household Textile Product Mills
3149	Other Textile Product Mills
31491	Textile Bag and Canvas Mills
314911	Textile Bag Mills
314912	Canvas and Related Product Mills
31499	All Other Textile Product Mills
314991	Rope, Cordage, and Twine Mills
314992	Tire Cord and Tire Fabric Mills
314999	All Other Miscellaneous Textile Product Mills

315 Apparel Manufacturing

3151	Apparel Knitting Mills
31511	Hosiery and Sock Mills
315111	Sheer Hosiery Mills
315119	Other Hosiery and Sock Mills
31519	Other Apparel Knitting Mills
315191	Outerwear Knitting Mills
315192	Underwear and Nightwear Knitting Mills

3152 Cut and Sew Apparel Manufacturing
31521 Cut and Sew Apparel Contractors
315211 Men's and Boys' Cut and Sew Apparel Contractors
315212 Women's, Girls', and Infants' Cut and Sew Apparel Contractors
31522 Men's and Boys' Cut and Sew Apparel Manufacturing
315221 Men's and Boys' Cut and Sew Underwear and Nightwear Manufacturing
315222 Men's and Boys' Cut and Sew Suit, Coat, and Overcoat Manufacturing
315223 Men's and Boys' Cut and Sew Shirt (except Work Shirt) Manufacturing
315224 Men's and Boys' Cut and Sew Trouser, Slack, and Jean Manufacturing
315225 Men's and Boys' Cut and Sew Work Clothing Manufacturing
315228 Men's and Boys' Cut and Sew Other Outerwear Manufacturing
31523 Women's and Girls' Cut and Sew Apparel Manufacturing
315231 Women's and Girls' Cut and Sew Lingerie, Loungewear, and Nightwear Manufacturing
315232 Women's and Girls' Cut and Sew Blouse and Shirt Manufacturing
315233 Women's and Girls' Cut and Sew Dress Manufacturing
315234 Women's and Girls' Cut and Sew Suit, Coat, Tailored Jacket, and Skirt Manufacturing
315239 Women's and Girls' Cut and Sew Other Outerwear Manufacturing
31529 Other Cut and Sew Apparel Manufacturing
315291 Infants' Cut and Sew Apparel Manufacturing
315292 Fur and Leather Apparel Manufacturing
315299 All Other Cut and Sew Apparel Manufacturing
3159 Apparel Accessories and Other Apparel Manufacturing
31599 Apparel Accessories and Other Apparel Manufacturing
315991 Hat, Cap, and Millinery Manufacturing
315992 Glove and Mitten Manufacturing
315993 Men's and Boys' Neckwear Manufacturing
315999 Other Apparel Accessories and Other Apparel Manufacturing

316 Leather and Allied Product Manufacturing

3161 Leather and Hide Tanning and Finishing
31611 Leather and Hide Tanning and Finishing
3162 Footwear Manufacturing
31621 Footwear Manufacturing
316211 Rubber and Plastics Footwear Manufacturing
316212 House Slipper Manufacturing
316213 Men's Footwear (except Athletic) Manufacturing
316214 Women's Footwear (except Athletic) Manufacturing
316219 Other Footwear Manufacturing
3169 Other Leather and Allied Product Manufacturing
31699 Other Leather and Allied Product Manufacturing
316991 Luggage Manufacturing
316992 Women's Handbag and Purse Manufacturing
316993 Personal Leather Good (except Women's Handbag and Purse) Manufacturing
316999 All Other Leather Good Manufacturing

321 Wood Product Manufacturing

3211 Sawmills and Wood Preservation
32111 Sawmills and Wood Preservation
321113 Sawmills
321114 Wood Preservation
3212 Veneer, Plywood, and Engineered Wood Product Manufacturing
32121 Veneer, Plywood, and Engineered Wood Product Manufacturing
321211 Hardwood Veneer and Plywood Manufacturing
321212 Softwood Veneer and Plywood Manufacturing
321213 Engineered Wood Member (except Truss) Manufacturing
321214 Truss Manufacturing
321219 Reconstituted Wood Product Manufacturing
3219 Other Wood Product Manufacturing
32191 Millwork
321911 Wood Window and Door Manufacturing
321912 Cut Stock, Resawing Lumber, and Planing
321918 Other Millwork (including Flooring)
32192 Wood Container and Pallet Manufacturing
32199 All Other Wood Product Manufacturing
321991 Manufactured Home (Mobile Home) Manufacturing
321992 Prefabricated Wood Building Manufacturing
321999 All Other Miscellaneous Wood Product Manufacturing

322 Paper Manufacturing

3221 Pulp, Paper, and Paperboard Mills

32211	Pulp Mills
32212	Paper Mills
322121	Paper (except Newsprint) Mills
322122	Newsprint Mills
32213	Paperboard Mills
3222	Converted Paper Product Manufacturing
32221	Paperboard Container Manufacturing
322211	Corrugated and Solid Fiber Box Manufacturing
322212	Folding Paperboard Box Manufacturing
322213	Setup Paperboard Box Manufacturing
322214	Fiber Can, Tube, Drum, and Similar Products Manufacturing
322215	Nonfolding Sanitary Food Container Manufacturing
32222	Paper Bag and Coated and Treated Paper Manufacturing
322221	Coated and Laminated Packaging Paper and Plastics Film Manufacturing
322222	Coated and Laminated Paper Manufacturing
322223	Plastics, Foil, and Coated Paper Bag Manufacturing
322224	Uncoated Paper and Multiwall Bag Manufacturing
322225	Laminated Aluminum Foil Manufacturing for Flexible Packaging Uses
322226	Surface-Coated Paperboard Manufacturing
32223	Stationery Product Manufacturing
322231	Die-Cut Paper and Paperboard Office Supplies Manufacturing
322232	Envelope Manufacturing
322233	Stationery, Tablet, and Related Product Manufacturing
32229	Other Converted Paper Product Manufacturing
322291	Sanitary Paper Product Manufacturing
322299	All Other Converted Paper Product Manufacturing

323 Printing and Related Support Activities

3231	Printing and Related Support Activities
32311	Printing
323110	Commercial Lithographic Printing
323111	Commercial Gravure Printing
323112	Commercial Flexographic Printing
323113	Commercial Screen Printing
323114	Quick Printing
323115	Digital Printing
323116	Manifold Business Forms Printing
323117	Books Printing
323118	Blankbook, Looseleaf Binders, and Devices Manufacturing
323119	Other Commercial Printing
32312	Support Activities for Printing
323121	Tradebinding and Related Work
323122	Prepress Services

324 Petroleum and Coal Products Manufacturing

3241	Petroleum and Coal Products Manufacturing
32411	Petroleum Refineries
32412	Asphalt Paving, Roofing, and Saturated Materials Manufacturing
324121	Asphalt Paving Mixture and Block Manufacturing
324122	Asphalt Shingle and Coating Materials Manufacturing
32419	Other Petroleum and Coal Products Manufacturing
324191	Petroleum Lubricating Oil and Grease Manufacturing
324199	All Other Petroleum and Coal Products Manufacturing

325 Chemical Manufacturing

3251	Basic Chemical Manufacturing
32511	Petrochemical Manufacturing
32512	Industrial Gas Manufacturing
32513	Synthetic Dye and Pigment Manufacturing
325131	Inorganic Dye and Pigment Manufacturing
325132	Synthetic Organic Dye and Pigment Manufacturing
32518	Other Basic Inorganic Chemical Manufacturing
325181	Alkalies and Chlorine Manufacturing
325182	Carbon Black Manufacturing
325188	All Other Basic Inorganic Chemical Manufacturing
32519	Other Basic Organic Chemical Manufacturing
325191	Gum and Wood Chemical Manufacturing
325192	Cyclic Crude and Intermediate Manufacturing
325193	Ethyl Alcohol Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
3252	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing
32521	Resin and Synthetic Rubber Manufacturing
325211	Plastics Material and Resin Manufacturing
325212	Synthetic Rubber Manufacturing
32522	Artificial and Synthetic Fibers and Filaments Manufacturing
325221	Cellulosic Organic Fiber Manufacturing

325222	Noncellulosic Organic Fiber Manufacturing
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing
32531	Fertilizer Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325312	Phosphatic Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
32532	Pesticide and Other Agricultural Chemical Manufacturing
3254	Pharmaceutical and Medicine Manufacturing
32541	Pharmaceutical and Medicine Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
3255	Paint, Coating, and Adhesive Manufacturing
32551	Paint and Coating Manufacturing
32552	Adhesive Manufacturing
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing
32561	Soap and Cleaning Compound Manufacturing
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325613	Surface Active Agent Manufacturing
32562	Toilet Preparation Manufacturing
3259	Other Chemical Product and Preparation Manufacturing
32591	Printing Ink Manufacturing
32592	Explosives Manufacturing
32599	All Other Chemical Product and Preparation Manufacturing
325991	Custom Compounding of Purchased Resins
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing

326 Plastics and Rubber Products Manufacturing

3261	Plastics Product Manufacturing
32611	Unsupported Plastics Film, Sheet, and Bag Manufacturing
326111	Unsupported Plastics Bag Manufacturing
326112	Unsupported Plastics Packaging Film and Sheet Manufacturing
326113	Unsupported Plastics Film and Sheet (except Packaging) Manufacturing
32612	Plastics Pipe, Pipe Fitting, and Unsupported Profile Shape Manufacturing
326121	Unsupported Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
32613	Laminated Plastics Plate, Sheet, and Shape Manufacturing
32614	Polystyrene Foam Product Manufacturing
32615	Urethane and Other Foam Product (except Polystyrene) Manufacturing
32616	Plastics Bottle Manufacturing
32619	Other Plastics Product Manufacturing
326191	Plastics Plumbing Fixture Manufacturing
326192	Resilient Floor Covering Manufacturing
326199	All Other Plastics Product Manufacturing
3262	Rubber Product Manufacturing
32621	Tire Manufacturing
326211	Tire Manufacturing (except Retreading)
326212	Tire Retreading
32622	Rubber and Plastics Hoses and Belting Manufacturing
32629	Other Rubber Product Manufacturing
326291	Rubber Product Manufacturing for Mechanical Use
326299	All Other Rubber Product Manufacturing

327 Nonmetallic Mineral Product Manufacturing

3271	Clay Product and Refractory Manufacturing
32711	Pottery, Ceramics, and Plumbing Fixture Manufacturing
327111	Vitreous China Plumbing Fixture and China and Earthenware Bathroom Accessories Manufacturing
327112	Vitreous China, Fine Earthenware, and Other Pottery Product Manufacturing
327113	Porcelain Electrical Supply Manufacturing
32712	Clay Building Material and Refractories Manufacturing
327121	Brick and Structural Clay Tile Manufacturing
327122	Ceramic Wall and Floor Tile Manufacturing
327123	Other Structural Clay Product Manufacturing
327124	Clay Refractory Manufacturing
327125	Nonclay Refractory Manufacturing
3272	Glass and Glass Product Manufacturing
32721	Glass and Glass Product Manufacturing
327211	Flat Glass Manufacturing
327212	Other Pressed and Blown Glass and Glassware Manufacturing

327213 Glass Container Manufacturing
327215 Glass Product Manufacturing Made of Purchased Glass
3273 Cement and Concrete Product Manufacturing
32731 Cement Manufacturing
32732 Ready-Mix Concrete Manufacturing
32733 Concrete Pipe, Brick, and Block Manufacturing
327331 Concrete Block and Brick Manufacturing
327332 Concrete Pipe Manufacturing
32739 Other Concrete Product Manufacturing
3274 Lime and Gypsum Product Manufacturing
32741 Lime Manufacturing
32742 Gypsum Product Manufacturing
3279 Other Nonmetallic Mineral Product Manufacturing
32791 Abrasive Product Manufacturing
32799 All Other Nonmetallic Mineral Product Manufacturing
327991 Cut Stone and Stone Product Manufacturing
327992 Ground or Treated Mineral and Earth Manufacturing
327993 Mineral Wool Manufacturing
327999 All Other Miscellaneous Nonmetallic Mineral Product Manufacturing

331 Primary Metal Manufacturing

3311 Iron and Steel Mills and Ferroalloy Manufacturing
33111 Iron and Steel Mills and Ferroalloy Manufacturing
331111 Iron and Steel Mills
331112 Electrometallurgical Ferroalloy Product Manufacturing
3312 Steel Product Manufacturing from Purchased Steel
33121 Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
33122 Rolling and Drawing of Purchased Steel
331221 Rolled Steel Shape Manufacturing
331222 Steel Wire Drawing
3313 Alumina and Aluminum Production and Processing
33131 Alumina and Aluminum Production and Processing
331311 Alumina Refining
331312 Primary Aluminum Production
331314 Secondary Smelting and Alloying of Aluminum
331315 Aluminum Sheet, Plate, and Foil Manufacturing
331316 Aluminum Extruded Product Manufacturing
331319 Other Aluminum Rolling and Drawing
3314 Nonferrous Metal (except Aluminum) Production and Processing
33141 Nonferrous Metal (except Aluminum) Smelting and Refining
331411 Primary Smelting and Refining of Copper
331419 Primary Smelting and Refining of Nonferrous Metal (except Copper and Aluminum)
33142 Copper Rolling, Drawing, Extruding, and Alloying
331421 Copper Rolling, Drawing, and Extruding
331422 Copper Wire (except Mechanical) Drawing
331423 Secondary Smelting, Refining, and Alloying of Copper
33149 Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, Extruding, and Alloying
331491 Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding
331492 Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)
3315 Foundries
33151 Ferrous Metal Foundries
331511 Iron Foundries
331512 Steel Investment Foundries
331513 Steel Foundries (except Investment)
33152 Nonferrous Metal Foundries
331521 Aluminum Die-Casting Foundries
331522 Nonferrous (except Aluminum) Die-Casting Foundries
331524 Aluminum Foundries (except Die-Casting)
331525 Copper Foundries (except Die-Casting)
331528 Other Nonferrous Foundries (except Die-Casting)

332 Fabricated Metal Product Manufacturing

3321 Forging and Stamping
33211 Forging and Stamping
332111 Iron and Steel Forging
332112 Nonferrous Forging
332114 Custom Roll Forming
332115 Crown and Closure Manufacturing
332116 Metal Stamping
332117 Powder Metallurgy Part Manufacturing
3322 Cutlery and Handtool Manufacturing
33221 Cutlery and Handtool Manufacturing
332211 Cutlery and Flatware (except Precious) Manufacturing
332212 Hand and Edge Tool Manufacturing
332213 Saw Blade and Handsaw Manufacturing

332214	Kitchen Utensil, Pot, and Pan Manufacturing
3323	Architectural and Structural Metals Manufacturing
33231	Plate Work and Fabricated Structural Product Manufacturing
332311	Prefabricated Metal Building and Component Manufacturing
332312	Fabricated Structural Metal Manufacturing
332313	Plate Work Manufacturing
33232	Ornamental and Architectural Metal Products Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
3324	Boiler, Tank, and Shipping Container Manufacturing
33241	Power Boiler and Heat Exchanger Manufacturing
33242	Metal Tank (Heavy Gauge) Manufacturing
33243	Metal Can, Box, and Other Metal Container (Light Gauge) Manufacturing
332431	Metal Can Manufacturing
332439	Other Metal Container Manufacturing
3325	Hardware Manufacturing
33251	Hardware Manufacturing
3326	Spring and Wire Product Manufacturing
33261	Spring and Wire Product Manufacturing
332611	Spring (Heavy Gauge) Manufacturing
332612	Spring (Light Gauge) Manufacturing
332618	Other Fabricated Wire Product Manufacturing
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing
33271	Machine Shops
33272	Turned Product and Screw, Nut, and Bolt Manufacturing
332721	Precision Turned Product Manufacturing
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
3328	Coating, Engraving, Heat Treating, and Allied Activities
33281	Coating, Engraving, Heat Treating, and Allied Activities
332811	Metal Heat Treating
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring
3329	Other Fabricated Metal Product Manufacturing
33291	Metal Valve Manufacturing
332911	Industrial Valve Manufacturing
332912	Fluid Power Valve and Hose Fitting Manufacturing
332913	Plumbing Fixture Fitting and Trim Manufacturing
332919	Other Metal Valve and Pipe Fitting Manufacturing
33299	All Other Fabricated Metal Product Manufacturing
332991	Ball and Roller Bearing Manufacturing
332992	Small Arms Ammunition Manufacturing
332993	Ammunition (except Small Arms) Manufacturing
332994	Small Arms Manufacturing
332995	Other Ordnance and Accessories Manufacturing
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332997	Industrial Pattern Manufacturing
332998	Enameled Iron and Metal Sanitary Ware Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing

333 Machinery Manufacturing

3331	Agriculture, Construction, and Mining Machinery Manufacturing
33311	Agricultural Implement Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
33312	Construction Machinery Manufacturing
33313	Mining and Oil and Gas Field Machinery Manufacturing
333131	Mining Machinery and Equipment Manufacturing
333132	Oil and Gas Field Machinery and Equipment Manufacturing
3332	Industrial Machinery Manufacturing
33321	Sawmill and Woodworking Machinery Manufacturing
33322	Plastics and Rubber Industry Machinery Manufacturing
33329	Other Industrial Machinery Manufacturing
333291	Paper Industry Machinery Manufacturing
333292	Textile Machinery Manufacturing
333293	Printing Machinery and Equipment Manufacturing
333294	Food Product Machinery Manufacturing
333295	Semiconductor Machinery Manufacturing
333298	All Other Industrial Machinery Manufacturing

3333	Commercial and Service Industry Machinery Manufacturing
33331	Commercial and Service Industry Machinery Manufacturing
333311	Automatic Vending Machine Manufacturing
333312	Commercial Laundry, Drycleaning, and Pressing Machine Manufacturing
333313	Office Machinery Manufacturing
333314	Optical Instrument and Lens Manufacturing
333315	Photographic and Photocopying Equipment Manufacturing
333319	Other Commercial and Service Industry Machinery Manufacturing
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing
33341	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing
333411	Air Purification Equipment Manufacturing
333412	Industrial and Commercial Fan and Blower Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
3335	Metalworking Machinery Manufacturing
33351	Metalworking Machinery Manufacturing
333511	Industrial Mold Manufacturing
333512	Machine Tool (Metal Cutting Types) Manufacturing
333513	Machine Tool (Metal Forming Types) Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333515	Cutting Tool and Machine Tool Accessory Manufacturing
333516	Rolling Mill Machinery and Equipment Manufacturing
333518	Other Metalworking Machinery Manufacturing
3336	Engine, Turbine, and Power Transmission Equipment Manufacturing
33361	Engine, Turbine, and Power Transmission Equipment Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
3339	Other General Purpose Machinery Manufacturing
33391	Pump and Compressor Manufacturing
333911	Pump and Pumping Equipment Manufacturing
333912	Air and Gas Compressor Manufacturing
333913	Measuring and Dispensing Pump Manufacturing
33392	Material Handling Equipment Manufacturing
333921	Elevator and Moving Stairway Manufacturing
333922	Conveyor and Conveying Equipment Manufacturing
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
33399	All Other General Purpose Machinery Manufacturing
333991	Power-Driven Handtool Manufacturing
333992	Welding and Soldering Equipment Manufacturing
333993	Packaging Machinery Manufacturing
333994	Industrial Process Furnace and Oven Manufacturing
333995	Fluid Power Cylinder and Actuator Manufacturing
333996	Fluid Power Pump and Motor Manufacturing
333997	Scale and Balance (except Laboratory) Manufacturing
333999	All Other Miscellaneous General Purpose Machinery Manufacturing

334 Computer and Electronic Product Manufacturing

3341	Computer and Peripheral Equipment Manufacturing
33411	Computer and Peripheral Equipment Manufacturing
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334113	Computer Terminal Manufacturing
334119	Other Computer Peripheral Equipment Manufacturing
3342	Communications Equipment Manufacturing
33421	Telephone Apparatus Manufacturing
33422	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
33429	Other Communications Equipment Manufacturing
3343	Audio and Video Equipment Manufacturing

33431	Audio and Video Equipment Manufacturing
3344	Semiconductor and Other Electronic Component Manufacturing
33441	Semiconductor and Other Electronic Component Manufacturing
334411	Electron Tube Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334414	Electronic Capacitor Manufacturing
334415	Electronic Resistor Manufacturing
334416	Electronic Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
33451	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
334518	Watch, Clock, and Part Manufacturing
334519	Other Measuring and Controlling Device Manufacturing
3346	Manufacturing and Reproducing Magnetic and Optical Media
33461	Manufacturing and Reproducing Magnetic and Optical Media
334611	Software Reproducing
334612	Prerecorded Compact Disc (except Software), Tape, and Record Reproducing
334613	Magnetic and Optical Recording Media Manufacturing

335 Electrical Equipment, Appliance, and Component Manufacturing

3351	Electric Lighting Equipment Manufacturing
33511	Electric Lamp Bulb and Part Manufacturing
33512	Lighting Fixture Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335129	Other Lighting Equipment Manufacturing
3352	Household Appliance Manufacturing
33521	Small Electrical Appliance Manufacturing
335211	Electric Housewares and Household Fan Manufacturing
335212	Household Vacuum Cleaner Manufacturing
33522	Major Appliance Manufacturing
335221	Household Cooking Appliance Manufacturing
335222	Household Refrigerator and Home Freezer Manufacturing
335224	Household Laundry Equipment Manufacturing
335228	Other Major Household Appliance Manufacturing
3353	Electrical Equipment Manufacturing
33531	Electrical Equipment Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335312	Motor and Generator Manufacturing
335313	Switchgear and Switchboard Apparatus Manufacturing
335314	Relay and Industrial Control Manufacturing
3359	Other Electrical Equipment and Component Manufacturing
33591	Battery Manufacturing
335911	Storage Battery Manufacturing
335912	Primary Battery Manufacturing
33592	Communication and Energy Wire and Cable Manufacturing
335921	Fiber Optic Cable Manufacturing
335929	Other Communication and Energy Wire Manufacturing
33593	Wiring Device Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335932	Noncurrent-Carrying Wiring Device Manufacturing
33599	All Other Electrical Equipment and Component Manufacturing

335991 Carbon and Graphite Product Manufacturing
335999 All Other Miscellaneous Electrical Equipment and Component Manufacturing

336 Transportation Equipment Manufacturing

3361 Motor Vehicle Manufacturing
33611 Automobile and Light Duty Motor Vehicle Manufacturing
336111 Automobile Manufacturing
336112 Light Truck and Utility Vehicle Manufacturing
33612 Heavy Duty Truck Manufacturing
3362 Motor Vehicle Body and Trailer Manufacturing
33621 Motor Vehicle Body and Trailer Manufacturing
336211 Motor Vehicle Body Manufacturing
336212 Truck Trailer Manufacturing
336213 Motor Home Manufacturing
336214 Travel Trailer and Camper Manufacturing
3363 Motor Vehicle Parts Manufacturing
33631 Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336311 Carburetor, Piston, Piston Ring, and Valve Manufacturing
336312 Gasoline Engine and Engine Parts Manufacturing
33632 Motor Vehicle Electrical and Electronic Equipment Manufacturing
336321 Vehicular Lighting Equipment Manufacturing
336322 Other Motor Vehicle Electrical and Electronic Equipment Manufacturing
33633 Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
33634 Motor Vehicle Brake System Manufacturing
33635 Motor Vehicle Transmission and Power Train Parts Manufacturing
33636 Motor Vehicle Seating and Interior Trim Manufacturing
33637 Motor Vehicle Metal Stamping
33639 Other Motor Vehicle Parts Manufacturing
336391 Motor Vehicle Air-Conditioning Manufacturing
336399 All Other Motor Vehicle Parts Manufacturing
3364 Aerospace Product and Parts Manufacturing
33641 Aerospace Product and Parts Manufacturing
336411 Aircraft Manufacturing
336412 Aircraft Engine and Engine Parts Manufacturing
336413 Other Aircraft Parts and Auxiliary Equipment Manufacturing
336414 Guided Missile and Space Vehicle Manufacturing
336415 Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336419 Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing
3365 Railroad Rolling Stock Manufacturing
33651 Railroad Rolling Stock Manufacturing
3366 Ship and Boat Building
33661 Ship and Boat Building
336611 Ship Building and Repairing
336612 Boat Building
3369 Other Transportation Equipment Manufacturing
33699 Other Transportation Equipment Manufacturing
336991 Motorcycle, Bicycle, and Parts Manufacturing
336992 Military Armored Vehicle, Tank, and Tank Component Manufacturing
336999 All Other Transportation Equipment Manufacturing

337 Furniture and Related Product Manufacturing

3371 Household and Institutional Furniture and Kitchen Cabinet Manufacturing
33711 Wood Kitchen Cabinet and Countertop Manufacturing
33712 Household and Institutional Furniture Manufacturing
337121 Upholstered Household Furniture Manufacturing
337122 Nonupholstered Wood Household Furniture Manufacturing
337124 Metal Household Furniture Manufacturing
337125 Household Furniture (except Wood and Metal) Manufacturing
337127 Institutional Furniture Manufacturing
337129 Wood Television, Radio, and Sewing Machine Cabinet Manufacturing
3372 Office Furniture (including Fixtures) Manufacturing
33721 Office Furniture (including Fixtures) Manufacturing
337211 Wood Office Furniture Manufacturing
337212 Custom Architectural Woodwork and Millwork Manufacturing
337214 Office Furniture (except Wood) Manufacturing

337215	Showcase, Partition, Shelving, and Locker Manufacturing
3379	Other Furniture Related Product Manufacturing
33791	Mattress Manufacturing
33792	Blind and Shade Manufacturing

339 Miscellaneous Manufacturing

3391	Medical Equipment and Supplies Manufacturing
33911	Medical Equipment and Supplies Manufacturing
339111	Laboratory Apparatus and Furniture Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339116	Dental Laboratories
3399	Other Miscellaneous Manufacturing
33991	Jewelry and Silverware Manufacturing
339911	Jewelry (except Costume) Manufacturing
339912	Silverware and Hollowware Manufacturing
339913	Jewelers' Material and Lapidary Work Manufacturing
339914	Costume Jewelry and Novelty Manufacturing
33992	Sporting and Athletic Goods Manufacturing
33993	Doll, Toy, and Game Manufacturing
339931	Doll and Stuffed Toy Manufacturing
339932	Game, Toy, and Children's Vehicle Manufacturing
33994	Office Supplies (except Paper) Manufacturing
339941	Pen and Mechanical Pencil Manufacturing
339942	Lead Pencil and Art Good Manufacturing
339943	Marking Device Manufacturing
339944	Carbon Paper and Inked Ribbon Manufacturing
33995	Sign Manufacturing
33999	All Other Miscellaneous Manufacturing
339991	Gasket, Packing, and Sealing Device Manufacturing
339992	Musical Instrument Manufacturing
339993	Fastener, Button, Needle, and Pin Manufacturing
339994	Broom, Brush, and Mop Manufacturing
339995	Burial Casket Manufacturing
339999	All Other Miscellaneous Manufacturing

42 WHOLESALE TRADE

421 Wholesale Trade, Durable Goods

4211	Motor Vehicle and Motor Vehicle Parts and Supplies Wholesalers
42111	Automobile and Other Motor Vehicle Wholesalers
42112	Motor Vehicle Supplies and New Parts Wholesalers
42113	Tire and Tube Wholesalers
42114	Motor Vehicle Parts (Used) Wholesalers
4212	Furniture and Home Furnishing Wholesalers
42121	Furniture Wholesalers
42122	Home Furnishing Wholesalers
4213	Lumber and Other Construction Materials Wholesalers
42131	Lumber, Plywood, Millwork, and Wood Panel Wholesalers
42132	Brick, Stone, and Related Construction Material Wholesalers
42133	Roofing, Siding, and Insulation Material Wholesalers
42139	Other Construction Material Wholesalers
4214	Professional and Commercial Equipment and Supplies Wholesalers
42141	Photographic Equipment and Supplies Wholesalers
42142	Office Equipment Wholesalers
42143	Computer and Computer Peripheral Equipment and Software Wholesalers
42144	Other Commercial Equipment Wholesalers
42145	Medical, Dental, and Hospital Equipment and Supplies Wholesalers
42146	Ophthalmic Goods Wholesalers
42149	Other Professional Equipment and Supplies Wholesalers
4215	Metal and Mineral (except Petroleum) Wholesalers
42151	Metal Service Centers and Offices
42152	Coal and Other Mineral and Ore Wholesalers
4216	Electrical Goods Wholesalers
42161	Electrical Apparatus and Equipment, Wiring Supplies, and Construction Material Wholesalers
42162	Electrical Appliance, Television, and Radio Set Wholesalers
42169	Other Electronic Parts and Equipment Wholesalers
4217	Hardware, and Plumbing and Heating Equipment and Supplies Wholesalers
42171	Hardware Wholesalers

42172 Plumbing and Heating Equipment and Supplies (Hydronics) Wholesalers
42173 Warm Air Heating and Air-Conditioning Equipment and Supplies Wholesalers
42174 Refrigeration Equipment and Supplies Wholesalers
4218 Machinery, Equipment, and Supplies Wholesalers
42181 Construction and Mining (except Oil Well) Machinery and Equipment Wholesalers
42182 Farm and Garden Machinery and Equipment Wholesalers
42183 Industrial Machinery and Equipment Wholesalers
42184 Industrial Supplies Wholesalers
42185 Service Establishment Equipment and Supplies Wholesalers
42186 Transportation Equipment and Supplies (except Motor Vehicle) Wholesalers
4219 Miscellaneous Durable Goods Wholesalers
42191 Sporting and Recreational Goods and Supplies Wholesalers
42192 Toy and Hobby Goods and Supplies Wholesalers
42193 Recyclable Material Wholesalers
42194 Jewelry, Watch, Precious Stone, and Precious Metal Wholesalers
42199 Other Miscellaneous Durable Goods Wholesalers

422 Wholesale Trade, Nondurable Goods

4221 Paper and Paper Product Wholesalers
42211 Printing and Writing Paper Wholesalers
42212 Stationery and Office Supplies Wholesalers
42213 Industrial and Personal Service Paper Wholesalers
4222 Drugs and Druggists' Sundries Wholesalers
42221 Drugs and Druggists' Sundries Wholesalers
4223 Apparel, Piece Goods, and Notions Wholesalers
42231 Piece Goods, Notions, and Other Dry Goods Wholesalers
42232 Men's and Boys' Clothing and Furnishings Wholesalers
42233 Women's, Children's, and Infants' Clothing and Accessories Wholesalers
42234 Footwear Wholesalers
4224 Grocery and Related Product Wholesalers
42241 General Line Grocery Wholesalers
42242 Packaged Frozen Food Wholesalers
42243 Dairy Product (except Dried or Canned) Wholesalers
42244 Poultry and Poultry Product Wholesalers
42245 Confectionery Wholesalers
42246 Fish and Seafood Wholesalers
42247 Meat and Meat Product Wholesalers
42248 Fresh Fruit and Vegetable Wholesalers
42249 Other Grocery and Related Products Wholesalers
4225 Farm Product Raw Material Wholesalers
42251 Grain and Field Bean Wholesalers
42252 Livestock Wholesalers
42259 Other Farm Product Raw Material Wholesalers
4226 Chemical and Allied Products Wholesalers
42261 Plastics Materials and Basic Forms and Shapes Wholesalers
42269 Other Chemical and Allied Products Wholesalers
4227 Petroleum and Petroleum Products Wholesalers
42271 Petroleum Bulk Stations and Terminals
42272 Petroleum and Petroleum Products Wholesalers (except Bulk Stations and Terminals)
4228 Beer, Wine, and Distilled Alcoholic Beverage Wholesalers
42281 Beer and Ale Wholesalers
42282 Wine and Distilled Alcoholic Beverage Wholesalers
4229 Miscellaneous Nondurable Goods Wholesalers
42291 Farm Supplies Wholesalers
42292 Book, Periodical, and Newspaper Wholesalers
42293 Flower, Nursery Stock, and Florists' Supplies Wholesalers
42294 Tobacco and Tobacco Product Wholesalers
42295 Paint, Varnish, and Supplies Wholesalers
42299 Other Miscellaneous Nondurable Goods Wholesalers

44-45 RETAIL TRADE

441 Motor Vehicle and Parts Dealers

4411 Automobile Dealers
44111 New Car Dealers
44112 Used Car Dealers
4412 Other Motor Vehicle Dealers
44121 Recreational Vehicle Dealers
44122 Motorcycle, Boat, and Other Motor Vehicle Dealers
441221 Motorcycle Dealers

441222 Boat Dealers
441229 All Other Motor Vehicle Dealers
4413 Automotive Parts, Accessories, and Tire Stores
44131 Automotive Parts and Accessories Stores
44132 Tire Dealers

442 Furniture and Home Furnishings Stores

4421 Furniture Stores
44211 Furniture Stores
4422 Home Furnishings Stores
44221 Floor Covering Stores
44229 Other Home Furnishings Stores
442291 Window Treatment Stores
442299 All Other Home Furnishings Stores

443 Electronics and Appliance Stores

4431 Electronics and Appliance Stores
44311 Appliance, Television, and Other Electronics Stores
443111 Household Appliance Stores
443112 Radio, Television, and Other Electronics Stores
44312 Computer and Software Stores
44313 Camera and Photographic Supplies Stores

444 Building Material and Garden Equipment and Supplies Dealers

4441 Building Material and Supplies Dealers
44411 Home Centers
44412 Paint and Wallpaper Stores
44413 Hardware Stores
44419 Other Building Material Dealers
4442 Lawn and Garden Equipment and Supplies Stores
44421 Outdoor Power Equipment Stores
44422 Nursery and Garden Centers

445 Food and Beverage Stores

4451 Grocery Stores
44511 Supermarkets and Other Grocery (except Convenience) Stores
44512 Convenience Stores
4452 Specialty Food Stores
44521 Meat Markets
44522 Fish and Seafood Markets
44523 Fruit and Vegetable Markets
44529 Other Specialty Food Stores
445291 Baked Goods Stores
445292 Confectionery and Nut Stores
445299 All Other Specialty Food Stores
4453 Beer, Wine, and Liquor Stores
44531 Beer, Wine, and Liquor Stores

446 Health and Personal Care Stores

4461 Health and Personal Care Stores
44611 Pharmacies and Drug Stores
44612 Cosmetics, Beauty Supplies, and Perfume Stores
44613 Optical Goods Stores
44619 Other Health and Personal Care Stores
446191 Food (Health) Supplement Stores
446199 All Other Health and Personal Care Stores

447 Gasoline Stations

4471 Gasoline Stations
44711 Gasoline Stations with Convenience Stores
44719 Other Gasoline Stations

448 Clothing and Clothing Accessories Stores

4481 Clothing Stores
44811 Men's Clothing Stores
44812 Women's Clothing Stores
44813 Children's and Infants' Clothing Stores
44814 Family Clothing Stores
44815 Clothing Accessories Stores
44819 Other Clothing Stores
4482 Shoe Stores
44821 Shoe Stores
4483 Jewelry, Luggage, and Leather Goods Stores
44831 Jewelry Stores
44832 Luggage and Leather Goods Stores

451 Sporting Goods, Hobby, Book, and Music Stores

4511 Sporting Goods, Hobby, and Musical Instrument Stores
45111 Sporting Goods Stores
45112 Hobby, Toy, and Game Stores
45113 Sewing, Needlework, and Piece Goods Stores
45114 Musical Instrument and Supplies Stores
4512 Book, Periodical, and Music Stores
45121 Book Stores and News Dealers
451211 Book Stores
451212 News Dealers and Newsstands
45122 Prerecorded Tape, Compact Disc, and Record Stores

452 General Merchandise Stores

4521 Department Stores
45211 Department Stores
4529 Other General Merchandise Stores
45291 Warehouse Clubs and Superstores
45299 All Other General Merchandise Stores

453 Miscellaneous Store Retailers

4531	Florists
45311	Florists
4532	Office Supplies, Stationery, and Gift Stores
45321	Office Supplies and Stationery Stores
45322	Gift, Novelty, and Souvenir Stores
4533	Used Merchandise Stores
45331	Used Merchandise Stores
4539	Other Miscellaneous Store Retailers
45391	Pet and Pet Supplies Stores
45392	Art Dealers
45393	Manufactured (Mobile) Home Dealers
45399	All Other Miscellaneous Store Retailers
453991	Tobacco Stores
453998	All Other Miscellaneous Store Retailers (except Tobacco Stores)

454 Nonstore Retailers

4541	Electronic Shopping and Mail-Order Houses
45411	Electronic Shopping and Mail-Order Houses
4542	Vending Machine Operators
45421	Vending Machine Operators
4543	Direct Selling Establishments
45431	Fuel Dealers
454311	Heating Oil Dealers
454312	Liquefied Petroleum Gas (Bottled Gas) Dealers
454319	Other Fuel Dealers
45439	Other Direct Selling Establishments

48-49 TRANSPORTATION AND WAREHOUSING

481 Air Transportation

4811	Scheduled Air Transportation
48111	Scheduled Air Transportation
481111	Scheduled Passenger Air Transportation
481112	Scheduled Freight Air Transportation
4812	Nonscheduled Air Transportation
48121	Nonscheduled Air Transportation
481211	Nonscheduled Chartered Passenger Air Transportation
481212	Nonscheduled Chartered Freight Air Transportation
481219	Other Nonscheduled Air Transportation

482 Rail Transportation

4821	Rail Transportation
48211	Rail Transportation
482111	Line-Haul Railroads
482112	Short Line Railroads

483 Water Transportation

4831	Deep Sea, Coastal, and Great Lakes Water Transportation
48311	Deep Sea, Coastal, and Great Lakes Water Transportation
483111	Deep Sea Freight Transportation
483112	Deep Sea Passenger Transportation
483113	Coastal and Great Lakes Freight Transportation
483114	Coastal and Great Lakes Passenger Transportation
4832	Inland Water Transportation
48321	Inland Water Transportation
483211	Inland Water Freight Transportation
483212	Inland Water Passenger Transportation

484 Truck Transportation

4841	General Freight Trucking
48411	General Freight Trucking, Local
48412	General Freight Trucking, Long-Distance
484121	General Freight Trucking, Long-Distance, Truckload
484122	General Freight Trucking, Long-Distance, Less Than Truckload
4842	Specialized Freight Trucking
48421	Used Household and Office Goods Moving
48422	Specialized Freight (except Used Goods) Trucking, Local
48423	Specialized Freight (except Used Goods) Trucking, Long-Distance

485 Transit and Ground Passenger Transportation

4851	Urban Transit Systems
48511	Urban Transit Systems
485111	Mixed Mode Transit Systems
485112	Commuter Rail Systems
485113	Bus and Other Motor Vehicle Transit Systems
485119	Other Urban Transit Systems
4852	Interurban and Rural Bus Transportation
48521	Interurban and Rural Bus Transportation
4853	Taxi and Limousine Service
48531	Taxi Service
48532	Limousine Service
4854	School and Employee Bus Transportation
48541	School and Employee Bus Transportation
4855	Charter Bus Industry
48551	Charter Bus Industry
4859	Other Transit and Ground Passenger Transportation
48599	Other Transit and Ground Passenger Transportation

485991 Special Needs Transportation
485999 All Other Transit and Ground Passenger Transportation

486 Pipeline Transportation

4861 Pipeline Transportation of Crude Oil
48611 Pipeline Transportation of Crude Oil
4862 Pipeline Transportation of Natural Gas
48621 Pipeline Transportation of Natural Gas
4869 Other Pipeline Transportation
48691 Pipeline Transportation of Refined Petroleum Products
48699 All Other Pipeline Transportation

487 Scenic and Sightseeing Transportation

4871 Scenic and Sightseeing Transportation, Land
48711 Scenic and Sightseeing Transportation, Land
4872 Scenic and Sightseeing Transportation, Water
48721 Scenic and Sightseeing Transportation, Water
4879 Scenic and Sightseeing Transportation, Other
48799 Scenic and Sightseeing Transportation, Other

488 Support Activities for Transportation

4881 Support Activities for Air Transportation
48811 Airport Operations
488111 Air Traffic Control
488119 Other Airport Operations
48819 Other Support Activities for Air Transportation
4882 Support Activities for Rail Transportation
48821 Support Activities for Rail Transportation
4883 Support Activities for Water Transportation
48831 Port and Harbor Operations
48832 Marine Cargo Handling
48833 Navigational Services to Shipping
48839 Other Support Activities for Water Transportation
4884 Support Activities for Road Transportation
48841 Motor Vehicle Towing
48849 Other Support Activities for Road Transportation
4885 Freight Transportation Arrangement
48851 Freight Transportation Arrangement
4889 Other Support Activities for Transportation
48899 Other Support Activities for Transportation
488991 Packing and Crating
488999 All Other Support Activities for Transportation

491 Postal Service

4911 Postal Service
49111 Postal Service

492 Couriers and Messengers

4921 Couriers
49211 Couriers
4922 Local Messengers and Local Delivery
49221 Local Messengers and Local Delivery

493 Warehousing and Storage

4931 Warehousing and Storage
49311 General Warehousing and Storage
49312 Refrigerated Warehousing and Storage
49313 Farm Product Warehousing and Storage
49319 Other Warehousing and Storage

51 INFORMATION

511 Publishing Industries

5111 Newspaper, Periodical, Book, and Database Publishers
51111 Newspaper Publishers
51112 Periodical Publishers
51113 Book Publishers
51114 Database and Directory Publishers
51119 Other Publishers
511191 Greeting Card Publishers
511199 All Other Publishers
5112 Software Publishers
51121 Software Publishers

512 Motion Picture and Sound Recording Industries

5121 Motion Picture and Video Industries
51211 Motion Picture and Video Production
51212 Motion Picture and Video Distribution
51213 Motion Picture and Video Exhibition
512131 Motion Picture Theaters (except Drive-Ins)
512132 Drive-In Motion Picture Theaters
51219 Postproduction Services and Other Motion Picture and Video Industries
512191 Teleproduction and Other Postproduction Services
512199 Other Motion Picture and Video Industries
5122 Sound Recording Industries
51221 Record Production
51222 Integrated Record Production/Distribution
51223 Music Publishers
51224 Sound Recording Studios
51229 Other Sound Recording Industries

513 Broadcasting and Telecommunications

5131	Radio and Television Broadcasting
51311	Radio Broadcasting
513111	Radio Networks
513112	Radio Stations
51312	Television Broadcasting
5132	Cable Networks and Program Distribution
51321	Cable Networks
51322	Cable and Other Program Distribution
5133	Telecommunications
51331	Wired Telecommunications Carriers
51332	Wireless Telecommunications Carriers (except Satellite)
513321	Paging
513322	Cellular and Other Wireless Telecommunications
51333	Telecommunications Resellers
51334	Satellite Telecommunications
51339	Other Telecommunications

514 Information Services and Data Processing Services

5141	Information Services
51411	News Syndicates
51412	Libraries and Archives
51419	Other Information Services
514191	On-Line Information Services
514199	All Other Information Services
5142	Data Processing Services
51421	Data Processing Services

52 FINANCE AND INSURANCE

521 Monetary Authorities - Central Bank

5211	Monetary Authorities - Central Bank
52111	Monetary Authorities - Central Bank

522 Credit Intermediation and Related Activities

5221	Depository Credit Intermediation
52211	Commercial Banking
52212	Savings Institutions
52213	Credit Unions
52219	Other Depository Credit Intermediation
5222	Nondepository Credit Intermediation
52221	Credit Card Issuing
52222	Sales Financing
52229	Other Nondepository Credit Intermediation
522291	Consumer Lending
522292	Real Estate Credit
522293	International Trade Financing
522294	Secondary Market Financing
522298	All Other Nondepository Credit Intermediation
5223	Activities Related to Credit Intermediation
52231	Mortgage and Nonmortgage Loan Brokers
52232	Financial Transactions Processing, Reserve, and Clearinghouse Activities
52239	Other Activities Related to Credit Intermediation

523 Securities, Commodity Contracts, and Other Financial Investments and Related Activities

5231	Securities and Commodity Contracts Intermediation and Brokerage
52311	Investment Banking and Securities Dealing
52312	Securities Brokerage
52313	Commodity Contracts Dealing
52314	Commodity Contracts Brokerage
5232	Securities and Commodity Exchanges
52321	Securities and Commodity Exchanges
5239	Other Financial Investment Activities
52391	Miscellaneous Intermediation
52392	Portfolio Management
52393	Investment Advice
52399	All Other Financial Investment Activities
523991	Trust, Fiduciary, and Custody Activities
523999	Miscellaneous Financial Investment Activities

524 Insurance Carriers and Related Activities

5241	Insurance Carriers
52411	Direct Life, Health, and Medical Insurance Carriers
524113	Direct Life Insurance Carriers
524114	Direct Health and Medical Insurance Carriers
52412	Direct Insurance (except Life, Health, and Medical) Carriers
524126	Direct Property and Casualty Insurance Carriers
524127	Direct Title Insurance Carriers
524128	Other Direct Insurance (except Life, Health, and Medical) Carriers
52413	Reinsurance Carriers
5242	Agencies, Brokerages, and Other Insurance Related Activities
52421	Insurance Agencies and Brokerages
52429	Other Insurance Related Activities
524291	Claims Adjusting
524292	Third Party Administration of Insurance and Pension Funds

524298 All Other Insurance Related Activities

525 Funds, Trusts, and Other Financial Vehicles

5251 Insurance and Employee Benefit Funds
52511 Pension Funds
52512 Health and Welfare Funds
52519 Other Insurance Funds
5259 Other Investment Pools and Funds
52591 Open-End Investment Funds
52592 Trusts, Estates, and Agency Accounts
52593 Real Estate Investment Trusts
52599 Other Financial Vehicles

53 REAL ESTATE AND RENTAL AND LEASING

531 Real Estate

5311 Lessors of Real Estate
53111 Lessors of Residential Buildings and Dwellings
53112 Lessors of Nonresidential Buildings (except Miniwarehouses)
53113 Lessors of Miniwarehouses and Self-Storage Units
53119 Lessors of Other Real Estate Property
5312 Offices of Real Estate Agents and Brokers
53121 Offices of Real Estate Agents and Brokers
5313 Activities Related to Real Estate
53131 Real Estate Property Managers
531311 Residential Property Managers
531312 Nonresidential Property Managers
53132 Offices of Real Estate Appraisers
53139 Other Activities Related to Real Estate

532 Rental and Leasing Services

5321 Automotive Equipment Rental and Leasing
53211 Passenger Car Rental and Leasing
532111 Passenger Car Rental
532112 Passenger Car Leasing
53212 Truck, Utility Trailer, and RV (Recreational Vehicle) Rental and Leasing
5322 Consumer Goods Rental
53221 Consumer Electronics and Appliances Rental
53222 Formal Wear and Costume Rental
53223 Video Tape and Disc Rental
53229 Other Consumer Goods Rental
532291 Home Health Equipment Rental
532292 Recreational Goods Rental
532299 All Other Consumer Goods Rental
5323 General Rental Centers
53231 General Rental Centers
5324 Commercial and Industrial Machinery and Equipment Rental and Leasing
53241 Construction, Transportation, Mining, and Forestry Machinery and Equipment Rental and Leasing
532411 Commercial Air, Rail, and Water Transportation Equipment Rental and Leasing
532412 Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing
53242 Office Machinery and Equipment Rental and Leasing
53249 Other Commercial and Industrial Machinery and Equipment Rental and Leasing

533 Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)

5331 Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
53311 Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)

54 PROFESSIONAL, SCIENTIFIC, AND TECHNICAL SERVICES

541 Professional, Scientific, and Technical Services

5411 Legal Services
54111 Offices of Lawyers
54112 Offices of Notaries
54119 Other Legal Services
541191 Title Abstract and Settlement Offices
541199 All Other Legal Services
5412 Accounting, Tax Preparation, Bookkeeping, and Payroll Services
54121 Accounting, Tax Preparation, Bookkeeping, and Payroll Services
541211 Offices of Certified Public Accountants
541213 Tax Preparation Services
541214 Payroll Services
541219 Other Accounting Services
5413 Architectural, Engineering, and Related Services
54131 Architectural Services
54132 Landscape Architectural Services
54133 Engineering Services
54134 Drafting Services
54135 Building Inspection Services
54136 Geophysical Surveying and Mapping Services
54137 Surveying and Mapping (except Geophysical) Services

54138	Testing Laboratories
5414	Specialized Design Services
54141	Interior Design Services
54142	Industrial Design Services
54143	Graphic Design Services
54149	Other Specialized Design Services
5415	Computer Systems Design and Related Services
54151	Computer Systems Design and Related Services
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541513	Computer Facilities Management Services
541519	Other Computer Related Services
5416	Management, Scientific, and Technical Consulting Services
54161	Management Consulting Services
541611	Administrative Management and General Management Consulting Services
541612	Human Resources and Executive Search Consulting Services
541613	Marketing Consulting Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541618	Other Management Consulting Services
54162	Environmental Consulting Services
54169	Other Scientific and Technical Consulting Services
5417	Scientific Research and Development Services
54171	Research and Development in the Physical, Engineering, and Life Sciences
54172	Research and Development in the Social Sciences and Humanities
5418	Advertising and Related Services
54181	Advertising Agencies
54182	Public Relations Agencies
54183	Media Buying Agencies
54184	Media Representatives
54185	Display Advertising
54186	Direct Mail Advertising
54187	Advertising Material Distribution Services
54189	Other Services Related to Advertising
5419	Other Professional, Scientific, and Technical Services
54191	Marketing Research and Public Opinion Polling
54192	Photographic Services
541921	Photography Studios, Portrait
541922	Commercial Photography
54193	Translation and Interpretation Services
54194	Veterinary Services
54199	All Other Professional, Scientific, and Technical Services

55 MANAGEMENT OF COMPANIES AND ENTERPRISES

551 Management of Companies and Enterprises

5511	Management of Companies and Enterprises
55111	Management of Companies and Enterprises
551111	Offices of Bank Holding Companies
551112	Offices of Other Holding Companies
551114	Corporate, Subsidiary, and Regional Managing Offices

56 ADMINISTRATIVE AND SUPPORT AND WASTE MANAGEMENT AND REMEDIATION SERVICES

561 Administrative and Support Services

5611	Office Administrative Services
56111	Office Administrative Services
5612	Facilities Support Services
56121	Facilities Support Services
5613	Employment Services
56131	Employment Placement Agencies
56132	Temporary Help Services
56133	Employee Leasing Services
5614	Business Support Services
56141	Document Preparation Services
56142	Telephone Call Centers
561421	Telephone Answering Services
561422	Telemarketing Bureaus
56143	Business Service Centers
561431	Private Mail Centers
561439	Other Business Service Centers (including Copy Shops)
56144	Collection Agencies
56145	Credit Bureaus
56149	Other Business Support Services
561491	Repossession Services
561492	Court Reporting and Stenotype Services
561499	All Other Business Support Services
5615	Travel Arrangement and Reservation Services
56151	Travel Agencies
56152	Tour Operators
56159	Other Travel Arrangement and Reservation Services

561591 Convention and Visitors Bureaus
561599 All Other Travel Arrangement and Reservation Services
5616 Investigation and Security Services
56161 Investigation, Guard, and Armored Car Services
561611 Investigation Services
561612 Security Guards and Patrol Services
561613 Armored Car Services
56162 Security Systems Services
561621 Security Systems Services (except Locksmiths)
561622 Locksmiths
5617 Services to Buildings and Dwellings
56171 Exterminating and Pest Control Services
56172 Janitorial Services
56173 Landscaping Services
56174 Carpet and Upholstery Cleaning Services
56179 Other Services to Buildings and Dwellings
5619 Other Support Services
56191 Packaging and Labeling Services
56192 Convention and Trade Show Organizers
56199 All Other Support Services

562 Waste Management and Remediation Services

5621 Waste Collection
56211 Waste Collection
562111 Solid Waste Collection
562112 Hazardous Waste Collection
562119 Other Waste Collection
5622 Waste Treatment and Disposal
56221 Waste Treatment and Disposal
562211 Hazardous Waste Treatment and Disposal
562212 Solid Waste Landfill
562213 Solid Waste Combustors and Incinerators
562219 Other Nonhazardous Waste Treatment and Disposal
5629 Remediation and Other Waste Management Services
56291 Remediation Services
56292 Materials Recovery Facilities
56299 All Other Waste Management Services
562991 Septic Tank and Related Services
562998 All Other Miscellaneous Waste Management Services

61 EDUCATIONAL SERVICES

611 Educational Services

6111 Elementary and Secondary Schools
61111 Elementary and Secondary Schools
6112 Junior Colleges
61121 Junior Colleges
6113 Colleges, Universities, and Professional Schools
61131 Colleges, Universities, and Professional Schools
6114 Business Schools and Computer and Management Training
61141 Business and Secretarial Schools
61142 Computer Training
61143 Professional and Management Development Training
6115 Technical and Trade Schools
61151 Technical and Trade Schools
611511 Cosmetology and Barber Schools
611512 Flight Training
611513 Apprenticeship Training
611519 Other Technical and Trade Schools
6116 Other Schools and Instruction
61161 Fine Arts Schools
61162 Sports and Recreation Instruction
61163 Language Schools
61169 All Other Schools and Instruction
611691 Exam Preparation and Tutoring
611692 Automobile Driving Schools
611699 All Other Miscellaneous Schools and Instruction
6117 Educational Support Services
61171 Educational Support Services

62 HEALTH CARE AND SOCIAL ASSISTANCE

621 Ambulatory Health Care Services

6211 Offices of Physicians
62111 Offices of Physicians
621111 Offices of Physicians (except Mental Health Specialists)
621112 Offices of Physicians, Mental Health Specialists
6212 Offices of Dentists
62121 Offices of Dentists
6213 Offices of Other Health Practitioners
62131 Offices of Chiropractors
62132 Offices of Optometrists
62133 Offices of Mental Health Practitioners (except Physicians)
62134 Offices of Physical, Occupational and Speech Therapists, and Audiologists
62139 Offices of All Other Health Practitioners
621391 Offices of Podiatrists
621399 Offices of All Other Miscellaneous Health Practitioners
6214 Outpatient Care Centers
62141 Family Planning Centers
62142 Outpatient Mental Health and Substance Abuse Centers
62149 Other Outpatient Care Centers

621491 HMO Medical Centers
621492 Kidney Dialysis Centers
621493 Freestanding Ambulatory Surgical and Emergency Centers
621498 All Other Outpatient Care Centers
6215 Medical and Diagnostic Laboratories
62151 Medical and Diagnostic Laboratories
621511 Medical Laboratories
621512 Diagnostic Imaging Centers
6216 Home Health Care Services
62161 Home Health Care Services
6219 Other Ambulatory Health Care Services
62191 Ambulance Services
62199 All Other Ambulatory Health Care Services
621991 Blood and Organ Banks
621999 All Other Miscellaneous Ambulatory Health Care Services

622 Hospitals

6221 General Medical and Surgical Hospitals
62211 General Medical and Surgical Hospitals
6222 Psychiatric and Substance Abuse Hospitals
62221 Psychiatric and Substance Abuse Hospitals
6223 Specialty (except Psychiatric and Substance Abuse) Hospitals
62231 Specialty (except Psychiatric and Substance Abuse) Hospitals

623 Nursing and Residential Care Facilities

6231 Nursing Care Facilities
62311 Nursing Care Facilities
6232 Residential Mental Retardation, Mental Health and Substance Abuse Facilities
62321 Residential Mental Retardation Facilities
62322 Residential Mental Health and Substance Abuse Facilities
6233 Community Care Facilities for the Elderly
62331 Community Care Facilities for the Elderly
623311 Continuing Care Retirement Communities
623312 Homes for the Elderly
6239 Other Residential Care Facilities
62399 Other Residential Care Facilities

624 Social Assistance

6241 Individual and Family Services
62411 Child and Youth Services
62412 Services for the Elderly and Persons with Disabilities
62419 Other Individual and Family Services
6242 Community Food and Housing, and Emergency and Other Relief Services
62421 Community Food Services
62422 Community Housing Services
624221 Temporary Shelters
624229 Other Community Housing Services
62423 Emergency and Other Relief Services
6243 Vocational Rehabilitation Services
62431 Vocational Rehabilitation Services
6244 Child Day Care Services
62441 Child Day Care Services

71 ARTS, ENTERTAINMENT, AND RECREATION

711 Performing Arts, Spectator Sports, and Related Industries

7111 Performing Arts Companies
71111 Theater Companies and Dinner Theaters
71112 Dance Companies
71113 Musical Groups and Artists
71119 Other Performing Arts Companies
7112 Spectator Sports
71121 Spectator Sports
711211 Sports Teams and Clubs
711212 Racetracks
711219 Other Spectator Sports
7113 Promoters of Performing Arts, Sports, and Similar Events
71131 Promoters of Performing Arts, Sports, and Similar Events with Facilities
71132 Promoters of Performing Arts, Sports, and Similar Events without Facilities
7114 Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures
71141 Agents and Managers for Artists, Athletes, Entertainers, and Other Public Figures
7115 Independent Artists, Writers, and Performers
71151 Independent Artists, Writers, and Performers

712 Museums, Historical Sites, and Similar Institutions

7121 Museums, Historical Sites, and Similar Institutions
71211 Museums
71212 Historical Sites
71213 Zoos and Botanical Gardens
71219 Nature Parks and Other Similar Institutions

713 Amusement, Gambling, and Recreation Industries

7131 Amusement Parks and Arcades
71311 Amusement and Theme Parks
71312 Amusement Arcades

7132 Gambling Industries
71321 Casinos (except Casino Hotels)
71329 Other Gambling Industries
7139 Other Amusement and Recreation Industries
71391 Golf Courses and Country Clubs
71392 Skiing Facilities
71393 Marinas
71394 Fitness and Recreational Sports Centers
71395 Bowling Centers
71399 All Other Amusement and Recreation Industries

72 ACCOMMODATION AND FOOD SERVICES

721 Accommodation

7211 Traveler Accommodation
72111 Hotels (except Casino Hotels) and Motels
72112 Casino Hotels
72119 Other Traveler Accommodation
721191 Bed-and-Breakfast Inns
721199 All Other Traveler Accommodation
7212 RV (Recreational Vehicle) Parks and Recreational Camps
72121 RV (Recreational Vehicle) Parks and Recreational Camps
721211 RV (Recreational Vehicle) Parks and Campgrounds
721214 Recreational and Vacation Camps (except Campgrounds)
7213 Rooming and Boarding Houses
72131 Rooming and Boarding Houses

722 Food Services and Drinking Places

7221 Full-Service Restaurants
72211 Full-Service Restaurants
7222 Limited-Service Eating Places
72221 Limited-Service Eating Places
722211 Limited-Service Restaurants
722212 Cafeterias
722213 Snack and Nonalcoholic Beverage Bars
7223 Special Food Services
72231 Food Service Contractors
72232 Caterers
72233 Mobile Food Services
7224 Drinking Places (Alcoholic Beverages)
72241 Drinking Places (Alcoholic Beverages)

81 OTHER SERVICES (EXCEPT PUBLIC ADMINISTRATION)

811 Repair and Maintenance

8111 Automotive Repair and Maintenance
81111 Automotive Mechanical and Electrical Repair and Maintenance
811111 General Automotive Repair
811112 Automotive Exhaust System Repair
811113 Automotive Transmission Repair
811118 Other Automotive Mechanical and Electrical Repair and Maintenance
81112 Automotive Body, Paint, Interior, and Glass Repair
811121 Automotive Body, Paint, and Interior Repair and Maintenance
811122 Automotive Glass Replacement Shops
81119 Other Automotive Repair and Maintenance
811191 Automotive Oil Change and Lubrication Shops
811192 Car Washes
811198 All Other Automotive Repair and Maintenance
8112 Electronic and Precision Equipment Repair and Maintenance
81121 Electronic and Precision Equipment Repair and Maintenance
811211 Consumer Electronics Repair and Maintenance
811212 Computer and Office Machine Repair and Maintenance
811213 Communication Equipment Repair and Maintenance
811219 Other Electronic and Precision Equipment Repair and Maintenance
8113 Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance
81131 Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance
8114 Personal and Household Goods Repair and Maintenance
81141 Home and Garden Equipment and Appliance Repair and Maintenance
811411 Home and Garden Equipment Repair and Maintenance
811412 Appliance Repair and Maintenance
81142 Reupholstery and Furniture Repair
81143 Footwear and Leather Goods Repair
81149 Other Personal and Household Goods Repair and Maintenance

812 Personal and Laundry Services

8121 Personal Care Services
81211 Hair, Nail, and Skin Care Services

812111 Barber Shops
812112 Beauty Salons
812113 Nail Salons
81219 Other Personal Care Services
812191 Diet and Weight Reducing Centers
812199 Other Personal Care Services
8122 Death Care Services
81221 Funeral Homes and Funeral Services
81222 Cemeteries and Crematories
8123 Drycleaning and Laundry Services
81231 Coin-Operated Laundries and Drycleaners
81232 Drycleaning and Laundry Services (except Coin-Operated)
81233 Linen and Uniform Supply
812331 Linen Supply
812332 Industrial Launderers
8129 Other Personal Services
81291 Pet Care (except Veterinary) Services
81292 Photofinishing
812921 Photofinishing Laboratories (except One-Hour)
812922 One-Hour Photofinishing
81293 Parking Lots and Garages
81299 All Other Personal Services

813 Religious, Grantmaking, Civic, Professional, and Similar Organizations

8131 Religious Organizations
81311 Religious Organizations
8132 Grantmaking and Giving Services
81321 Grantmaking and Giving Services
813211 Grantmaking Foundations
813212 Voluntary Health Organizations
813219 Other Grantmaking and Giving Services
8133 Social Advocacy Organizations
81331 Social Advocacy Organizations
813311 Human Rights Organizations
813312 Environment, Conservation and Wildlife Organizations
813319 Other Social Advocacy Organizations
8134 Civic and Social Organizations
81341 Civic and Social Organizations
8139 Business, Professional, Labor, Political, and Similar Organizations
81391 Business Associations
81392 Professional Organizations
81393 Labor Unions and Similar Labor Organizations
81394 Political Organizations
81399 Other Similar Organizations (except Business, Professional, Labor, and Political Organizations)

814 Private Households

8141 Private Households
81411 Private Households

92 PUBLIC ADMINISTRATION

921 Executive, Legislative, and Other General Government Support

9211 Executive, Legislative, and Other General Government Support
92111 Executive Offices
92112 Legislative Bodies
92113 Public Finance Activities
92114 Executive and Legislative Offices, Combined
92115 American Indian and Alaska Native Tribal Governments
92119 Other General Government Support

922 Justice, Public Order, and Safety Activities

9221 Justice, Public Order, and Safety Activities
92211 Courts
92212 Police Protection
92213 Legal Counsel and Prosecution
92214 Correctional Institutions
92215 Parole Offices and Probation Offices
92216 Fire Protection
92219 Other Justice, Public Order, and Safety Activities

923 Administration of Human Resource Programs

9231 Administration of Human Resource Programs
92311 Administration of Education Programs
92312 Administration of Public Health Programs
92313 Administration of Human Resource Programs (except Education, Public Health, and Veterans' Affairs Programs)
92314 Administration of Veterans' Affairs

924 Administration of Environmental Quality Programs

9241 Administration of Environmental Quality Programs
92411 Administration of Air and Water Resource and Solid Waste Management Programs
92412 Administration of Conservation Programs

925 Administration of Housing Programs, Urban Planning, and Community Development

9251 Administration of Housing Programs, Urban Planning, and Community Development
92511 Administration of Housing Programs
92512 Administration of Urban Planning and Community and Rural Development

926 Administration of Economic Programs

9261 Administration of Economic Programs
92611 Administration of General Economic Programs
92612 Regulation and Administration of Transportation Programs
92613 Regulation and Administration of Communications, Electric, Gas, and Other Utilities
92614 Regulation of Agricultural Marketing and Commodities
92615 Regulation, Licensing, and Inspection of Miscellaneous Commercial Sectors

927 Space Research and Technology

9271 Space Research and Technology
92711 Space Research and Technology

928 National Security and International Affairs

9281 National Security and International Affairs
92811 National Security
92812 International Affairs

APPENDIX F

AQUIFER TESTS

AQUIFER TESTS

Aquifer tests are conducted to determine the hydraulic properties of an aquifer system such as hydraulic conductivity, transmissivity, and storativity. These properties are useful in determining fate and transport of contaminant plumes and in designing effective groundwater remediation systems.

Since a pumping test and a slug test evaluate a much larger volume of the aquifer, they are the most commonly accepted methods for determining representative aquifer properties at sites with groundwater monitoring wells. If a site does not have groundwater monitoring wells, the aquifer properties may be estimated by methods discussed in this section. Other aquifer evaluation methods may be used following prior Department approval.

It is essential to have a basic understanding of groundwater hydraulics and the effects an aquifer test will have on the aquifer system. It is not the intent of this section to give a detailed explanation of every aquifer test and its limitations, but rather to review basic terminology and provide the fundamental concepts for conducting an aquifer test. A general discussion of pumping tests and slug tests is presented in this section. The reader is directed to the references in this section for more detailed procedures in conducting the aquifer tests.

AQUIFER DETERMINATION

The type of aquifer must be determined as unconfined, confined or leaky confined. An ***unconfined*** aquifer is defined as an aquifer where the groundwater is exposed to the atmosphere through openings in the overlying materials or above which a low permeable confining layer or aquitard is absent. An unconfined aquifer is often referred to as a water table aquifer. In an unconfined aquifer, the water level in wells or piezometers is free to rise and fall under the influence of atmospheric pressure and may typically have a static level below the upper stratigraphic boundary of the aquifer.

A ***confined*** aquifer is defined as an aquifer in which the groundwater is isolated from the atmosphere at the point of discharge by impermeable geologic formations. In a confined aquifer, the water level rises in wells or piezometers to some static level above the upper stratigraphic boundary of the aquifer. Occasionally, a less permeable confining layer will allow surrounding formation water to slowly seep through to the aquifer. This is often referred to as a semi-confined or ***leaky confined*** aquifer.

An **aquitard** is a less permeable formation that transmits water very slowly from one aquifer to another. An **aquifer system** consists of the aquifer and any aquitards.

The **hydraulic head**, h, is defined as the total mechanical energy per unit weight of water. Hydraulic head has the units of length and is given by the relationship:

$$\mathbf{h = z + h_p}$$

where:

h - hydraulic head (ft.)
z - elevation head (ft.)
h_p - pressure head (ft.)

In a confined aquifer, the pressure head of groundwater at the top of the aquifer is always greater than zero. The hydraulic head in a confined aquifer is typically characterized as the vertical distance by which the static water level in a well or piezometer exceeds the upper stratigraphic boundary of the aquifer.

Since an unconfined aquifer is free to rise and fall in response to atmospheric pressure, the pressure head is zero.

AQUIFER PROPERTIES

Hydraulic Conductivity (K)

Hydraulic conductivity, or "coefficient of permeability" is a measure of the capacity of a porous medium to transmit water. It is defined as the volume of water that will move in a unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. The dimensions of hydraulic conductivity are length per time or velocity. Hydraulic conductivity is governed by the size and the shape of the pores, the effectiveness of the interconnection between pores, roughness of mineral particles, degree of soil saturation, and the physical properties of the fluid.

Saturated Aquifer Thickness (b)

The **saturated thickness** of the aquifer may be determined from published reference boring/well logs or field data. The saturated thickness of the aquifer has the dimensions of length. For confined units, the saturated thickness will correspond to the thickness of the aquifer. For unconfined units, the saturated thickness represents the vertical distance from the mean annual static water level elevation to the base of the aquifer. For multi-layered or interconnected units, the saturated thickness of each sub-unit should be determined separately.

Transmissivity (T)

Transmissivity is defined as the rate at which water can be transmitted through a vertical strip of aquifer one unit wide, extending the full saturated thickness of the aquifer, under a unit of hydraulic gradient. Transmissivity is expressed by the relationship:

$$T = K * b$$

where:

T - transmissivity (ft^2/day)
K - hydraulic conductivity (ft/day)
b - saturated aquifer thickness (ft)

Specific Yield (S_y)

Specific yield is defined as the percent ratio of the volume of water that an unconfined aquifer will yield by gravity to the unit volume of the unconfined aquifer. As the water level falls in an unconfined aquifer, water is drained from the pore spaces. Specific yields cannot be determined for confined aquifers because the aquifer materials are not drained during pumping (ie. the aquifer remains saturated). Specific yield is given by the relationship:

$$S_y = \frac{\text{Vol. of water an unconfined aquifer will yield by gravity}}{\text{Unit Vol. of the unconfined aquifer}}$$

Specific Storage (S_s)

Specific storage is defined as the volume of water that is stored or released from the aquifer by the expansion of water and compression of the soil or rock. The dimensions for specific storage are 1/length or length^{-1}.

Storativity (S)

Storativity, or coefficient of storage, is a dimensionless coefficient defined as the volume of water that a permeable unit will release from storage per unit surface area per unit change in head. In an unconfined unit, the level of saturation rises or falls with changes in the amount of water in storage due to specific yield. Storativity for an unconfined aquifer is expressed by the following relationship:

$$S = S_y + S_s b$$

where:

S - storativity (dimensionless)
S_y - specific yield (%)
S_s - specific storage (ft^{-1})
b - saturated aquifer thickness (ft)

In a confined aquifer, the aquifer remains saturated during pumping and specific yield is zero. The storativity for a confined aquifer is given by the relationship:

$$\mathbf{S = S_s\, b}$$

where:

S - storativity (dimensionless)
S_s - specific storage (ft^{-1})
b - saturated aquifer thickness (ft)

Porosity (n)

Porosity is defined as the percent ratio of the volume of voids in a rock or sediment to the total volume of the rock or sediment. The voids in the rock or sediment include all pore spaces that are liquid or air filled and not available to conduct flow because of discontinuities. The void spaces that are connected and available to conduct flow are termed **effective porosity**.

DETERMINING AQUIFER PROPERTIES BY DIRECT MEASUREMENT

One criterion for determining groundwater classification is to estimate the maximum sustainable well yield of an aquifer. **Maximum sustainable well yield** is defined as the maximum sustainable volume of water that a well will discharge over a given period of time. It is has the dimensions of volume per time. All water wells used to estimate maximum sustainable yield shall be designed, constructed and developed in accordance with the latest versions of the LDEQ and LDOTD *Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook* and the LDOTD *Water Well Rules, Regulations, and Standards*.

For sites with groundwater monitoring wells, aquifer properties such as hydraulic conductivity, transmissivity, and storativity can be measured by two common methods, pumping tests and slug tests, which are discussed below.

PUMPING TESTS

In a pumping test, groundwater is extracted from a pumping well with water level measurements observed in the pumping well and in one or more observation wells. Pumping tests can be performed within an aquifer to collect information relative to the aquifer in which the pumped well and observation wells are located. In addition, a **stress pumping test** can be performed to determine the transmissivity or degree of leakage between an unconfined aquifer and a deeper leaky confined aquifer. In this test, the pumped well is located in the lower aquifer while the observation wells are located in the overlying aquifer which is separated by a less permeable aquitard.

The difference in hydraulic head in the pumped well or in the observation wells at the start of the test and at some time after the test begins is referred to as **drawdown**, **s**, and has the dimension of length. The distance from the center of the pumping well to the point where drawdown is zero is referred to as the **radius of influence**, **R**, and has the dimension of length. The depressed area of influence around the pumped well is referred to as a **cone of depression** because it is shaped like an inverted cone. As pumping continues, drawdown increases and the cone of depression expands. If the pumping rate is constant and sustained over a sufficient time period, the drawdown and radius of influence become constant referred to as an **equilibrium** or **steady state** condition. Non-steady state conditions are referred to as **transient** flow. The rate of change in hydraulic head per unit of distance of flow in a given direction is the **hydraulic gradient**, **i**, and has the dimensions of length per length. Groundwater velocities are highest near the pumped well due to the increase in hydraulic gradient, and decrease radially away from the well.

There are basically two types of pumping tests: a constant-rate pumping test and a step-drawdown pumping test. A **constant-rate pumping test** is performed by pumping the well at a constant rate for the duration of the test. It is most often used to obtain aquifer properties such as transmissivity and storativity as well as specific capacity of the well. Depending on the type of aquifer, the well is pumped at a constant rate for an extended period of time. During this time, periodic drawdown measurements are taken in the pumped well and observation wells. Upon completion of the test, the recovery data is often collected to check the results against the data collected from the actual test. The aquifer performance can be predicted by plotting the drawdown data versus the time the data was collected and evaluating the transmissivity and storage coefficients.

Another type of pumping test is the **step-drawdown pumping test** in which the pumping rate is increased in steps at regular intervals. Again, the drawdown data is collected in both the pumped well and the observation wells and plotted versus time to obtain the transmissivity and storage coefficients. This test is primarily used to determine the reduction in specific capacity with increasing yields.

CONCEPTUAL DESIGN OF A PUMPING TEST

Determine Site Constraints

During the site investigation, soil data should be collected to determine the site's geologic and hydrologic characteristics. The site investigation shall be performed in accordance with RECAP Appendix B, as well as the guidelines established in the latest versions of the LDEQ and LDOTD *Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook* and the LDOTD *Water Well Rules, Regulations, and Standards.*

When installing groundwater monitoring wells, consideration of well placement should be given to the vertical and horizontal delineation of the contaminant, as well as for well placement in conducting an aquifer test. One should consider well design (i.e., partially penetrating wells, fully penetrating wells, etc.) and well location (i.e., recharge zones, lateral discontinuities in an aquifer, etc.) which may place additional complexities in evaluating the aquifer test data.

Existing groundwater monitoring wells may be used to conduct the aquifer test provided the wells were constructed in accordance with the latest versions of the LDEQ and LDOTD

Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook and the LDOTD *Water Well Rules, Regulations, and Standards*.

Determine Appropriate Conceptual Model

The single most important step in the analysis of aquifer test data is the selection of an appropriate conceptual model. Each conceptual model has a set of assumptions about the geometry and hydraulic behavior which one must determine appropriate for the study site. Based on the observed site constraints, a conceptual model or models must be selected to determine the aquifer properties.

The conceptual model is usually based on geologic and hydrologic data generated during the site investigation, design of monitoring wells, the drawdown data obtained during the aquifer test, and the set of assumptions for the study site.

A list of several conceptual models and references are provided in Table F-1 to direct the reader to a more detailed description of the mathematical models and assumptions. Other conceptual models may be used following Department approval.

SLUG TESTS

A **slug test** involves either injecting or withdrawing a known volume of water into or out of a well and immediately measuring the rate at which the water level falls or rises back to static conditions. For wells that are partially penetrating, the withdrawal slug test is recommended to overcome the affects of the filter pack. For fully penetrating wells where the well screen remains completely saturated, either the injection or withdrawal slug test is appropriate.

The flow of water into or out of the well is governed by the formation characteristics. The water level in the well is measured prior to and immediately after the abrupt injection or withdrawal of water. The subsequent water levels are measured until the water level returns to static or equilibrium conditions. In aquifers with high permeability, recovery may occur so rapidly that the use of a pressure transducer is required. The pressure transducer measures the pressure changes in the well as the water level changes and stores the data in the recording equipment. The data is plotted as a change in water level versus time from which aquifer properties such as hydraulic conductivity, transmissivity, and storage coefficients are estimated. When averaging a number of hydraulic conductivity results from a site, the geometric mean shall be used.

Several methods used to evaluate data from slug tests are presented in Table F-2. Other conceptual models may be used following Department approval.

DETERMINING AQUIFER PROPERTIES BY ESTIMATION

In some instances, groundwater monitoring wells may not be present on-site in which to conduct pumping or slug tests. In these situations, it is acceptable to obtain an estimate of the aquifer properties based on engineering and geological material descriptions as well as from correlations between these descriptions and some commonly measured soil properties. Guidelines for estimating these aquifer properties are provided below.

Hydraulic Conductivity (K)

Published References

Many references are available which give a generic range of values for hydraulic conductivity, or coefficient of permeability, for various types of soil media. First, the soil media from the aquifer must be analyzed for Atterberg limits (ASTM D-4318) and particle size distribution (ASTM D-422) in order to properly classify the soil in accordance with the Unified Soil Classification System (ASTM D-2487). Once the soil has been properly classified, a hydraulic conductivity value corresponding to the type of soil media may be selected from a published reference. The selected hydraulic conductivity value is subject to Departmental approval. If multiple soil types are encountered within an aquifer, the predominant soil type should used for the Unified Soil Classification System.

Laboratory Determination

Hydraulic conductivity for a soil type can be determined from two standard laboratory procedures. In these tests, an undisturbed sample of the aquifer material is used in either a constant head (ASTM D-2434) or falling head (ASTM D-5084) permeability test. Typically, the constant head test is used for sands and gravels while the falling head is used for fine grained soils.

Single Boring Method

The single boring method provides a quick estimate of hydraulic conductivity for sites without groundwater monitoring wells. In this method, a boring is advanced into the aquifer with the water level in the boring allowed to reach static or equilibrium conditions. Water is then quickly removed with water level versus time measurements collected in a similar method as the rising head slug test. The data is then evaluated using the Ernst or Hooghoudt equations to provide a quick estimate of hydraulic conductivity. These equations assume the soil is homogeneous, the water table remains in a horizontal position, and that water flows horizontally into the sides of the borehole and vertically through the bottom of the borehole. The Ernst and Hooghoudt equations are presented in Figure 1.

Particle Size Analysis

The Hazen method is an empirical relationship that may be used to determine hydraulic conductivity from a particle size analysis (ASTM D422) of the saturated media. The relationship is based on observations of loose, clean sand; therefore, the method should only be used on unconsolidated material having a grain-size of 10 percent finer by weight of 0.1 to 3.0 mm ($0.1 < D_{10} < 3.0$ mm). The Hazen equation is presented in Figure 2.

Saturated Aquifer Thickness (b)

If the saturated aquifer thickness is unknown, an estimated value can often be obtained from many published references or well logs. This information may be available through the United States Geological Survey (USGS), the Louisiana Geological Survey (LGS), the Louisiana Department of Natural Resources (LDNR), or the Louisiana Department of Transportation and Development (LDOTD) Water Resources Section. If a boring is advanced into an aquifer of unknown thickness, the estimated saturated aquifer thickness shall be set equal to the maximum penetrated thickness of the water-bearing unit (as determined from boring logs) plus 10 feet. If a boring is not advanced, the default aquifer thickness shall be set equal to 10 feet.

Specific Yield (S_y) and Specific Storage (S_s)

Many published references are available which give generic values for specific yield and specific storage in various types of soil media. Prior to selecting a generic value for these parameters, the soil must be classified in accordance with the Unified Soil Classification System (ASTM D-2487). The selected values for specific yield and specific storage are subject to Departmental approval.

ESTIMATION OF WELL YIELD

The development of the Theis equation takes into consideration the effect of pumping time on well yield. The Theis equation is based on assumptions such as the pumping well being 100 percent efficient, the water table is horizontal without slope, the aquifer formation is uniform in thickness and infinite in areal extent, the hydraulic conductivity is the same in all directions, groundwater flow is laminar, etc. Cooper and Jacob observed that if the pumping test is of sufficient duration or the distance from the pumping well to the observation well is sufficiently small, the exponential integral function of the Theis equation can be replaced with a logarithmic term simplifying the evaluation of well hydraulics. Applying some assumptions of storativity, drawdown, distance from pumping well to observation well and pumping duration to the Cooper and Jacob modification of the Theis nonequilibrium well equation, an estimate of well yield can be obtained. The estimated well yield equations are presented in Figure 3.

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Table F-1
Conceptual Pumping Test Models

Aquifer Type	Flow Condition	Aquitard Leakage	Aquitard Storage	Well Storage	Partial Well Penetration	Anisotropic Properties	References
Confined	Equilibrium	No	No	No	No	No	Thiem (1906)
Unconfined	Equilibrium	No	No	No	No	No	Thiem (1906)
Confined	Transient	No	No	No	No	No	Theis (1935)
Confined	Transient	Yes	No	No	No	No	Hantush & Jacob (1955)
Confined	Transient	Yes	Yes	No	No	No	Hantush (1964)
Confined	Transient	No	No	No	Yes	Yes	Hantush (1964)
Confined	Transient	Yes	No	No	Yes	Yes	Hantush (1964)
Confined	Transient	No	No	Yes	No	No	Papadopulos & Cooper (1967)
Confined	Transient	Yes	No	Yes	No	No	Lai & Su (1974)
Confined	Transient	Yes	Yes	No	No	No	Boulton & Streltsova (1977)
Confined	Transient	No	No	No	No	Yes	Papadopulos (1965)
Confined to Unconfined	Transient	No	No	No	No	No	Moench & Prickett (1972)
Unconfined	Transient	No	No	No	No	Yes	Neuman (1972)
Unconfined	Transient	No	No	No	Yes	Yes	Neuman (1974)
Unconfined	Transient	No	No	Yes	Yes	Yes	Boulton & Streltsova (1976)
Unconfined	Transient	Yes	Yes	No	Yes	Yes	Boulton & Streltsova (1975)

Table F- 2

Conceptual Slug Test Models

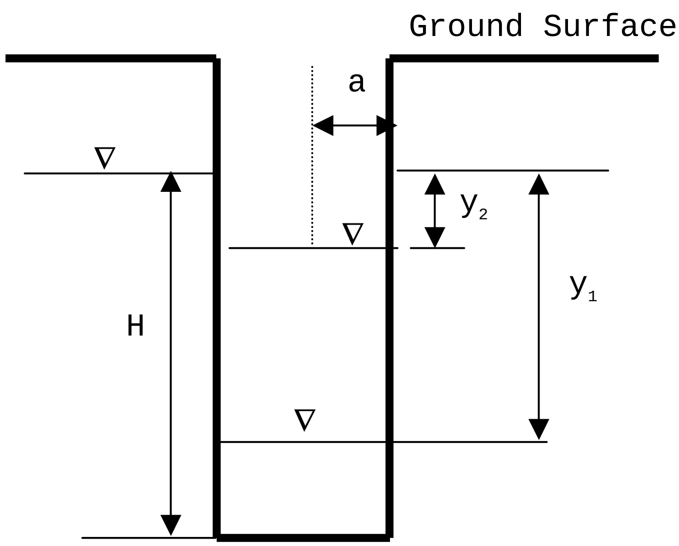
Aquifer Type	Flow Condition	Aquitard Leakage	Aquitard Storage	Partial Penetration	Anisotropic Properties	References
Confined	Transient	No	No	Yes	Yes	Hvorslev (1951)
Confined	Transient	No	No	No	No	Cooper et al. (1967)
Unconfined or Leaky	Transient	Yes	No	Yes	No	Bouwer & Rice (1976)

(After Dawson and Istok, 1991)

Figure 1 – Ernst and Hooghoudt Equations

Reference:

Dunn, Irving S., Loren R. Anderson, and Fred W. Kiefer, *Fundamentals of Geotechnical Analysis*, 1980, John Wiley and Sons, New York, New York.



<u>Hooghoudt Equation</u>

$$k = \frac{aL}{(2H + a)t} \ln \frac{y_1}{y_2}$$

<u>Ernst Equation</u>

$$k = \frac{40}{\left(20 + \frac{H}{a}\right)\left(2 - \frac{y}{H}\right)} \frac{a}{y} \frac{\Delta y}{\Delta t}$$

where:

k = coefficient of permeability, meters/second
a = boring radius, meters
L = an empirical length over which the head loss occurs, meters

$$L = \frac{aH}{0.19}$$

H = water level, meters
t = time of measurement, seconds
y_1 = initial drawdown, meters
y_2 = drawdown at time t, meters
Δy = rise in water level (meters) during time Δt (seconds)
y = average drawdown during time of measurement, meters

Figure 2 – Hazen equation

Reference:

Dunn, Irving S., Loren R. Anderson, and Fred W. Kiefer, *Fundamentals of Geotechnical Analysis*, 1980, John Wiley and Sons, New York, New York.

Note: The equation should only be used if 0.1 mm < D_{10} < 3.0 mm

$$k = c\,(D_{10})^2$$

where:

k = coefficient of permeability, cm/sec
c = a constant that varies from 1.0 to 1.5
D_{10} = grain size (mm) that corresponds to 10 percent finer by weight

Figure 3 – Estimation of Well Yield

Reference:

Driscoll, F.G., *Groundwater and Wells*, 1986, 2nd ed., Johnson Division, St. Paul, Minnesota.

The estimated well yield equations are derived from the Cooper and Jacob (1946) modification to the Theis (1935) nonequilibrium well equation. The Cooper and Jacob modification using English engineering units is given as:

$$s = \frac{264Q}{T}\log\frac{0.3\,T\,t}{r^2\,S}$$

where:

s = drawdown at a distance (r) from the pumping well, feet
Q = yield from pumping well, gpm
T = transmissivity, gpd/ft
t = time of pumping, days
r = distance from pumping well to observation well where drawdown is measured, feet
S = storativity, dimensionless

The estimated well yield equations are derived using some assumptions and logarithmic functions. The estimated well yield equations and assumptions are given as:

Confined Aquifer

$$Q = \frac{60\,h_c\,K\,b}{9.3 + \log(K\,b)}$$

Unconfined Aquifer

$$Q = \frac{16\,K\,b^2}{6.3 + \log(K\,b)}$$

where:

Q = estimated well yield, gpm
h_c = confining head above the upper stratigraphic boundary of the aquifer, feet
K = hydraulic conductivity of the aquifer media, cm/sec
b = saturated aquifer thickness, feet

Assumptions:

$s = 0.75\ h_c$ feet (confined aquifer)
$s = 0.2\ b$ feet (unconfined aquifer)
$t = 7$ days
$r = 0.5$ feet
$S = 1.0E\text{-}04$ (confined)
$S = 1.0E\text{-}01$ (unconfined)

APPENDIX G

GUIDELINES FOR ADDRESSING ADDITIVE HEALTH EFFECTS UNDER THE RECAP

TABLE OF CONTENTS

LIST OF TABLES

G1.0 GENERAL GUIDELINES FOR ADDRESSING ADDITIVE HEALTH EFFECTS

Risk-based RECAP Standards based on noncarcinogenic health effects shall be adjusted to account for additivity if there are multiple COC present that elicit the same critical effect or have the same target organ/system. The risk-based RS requiring adjustment include: (1) $Soil_{ni}$; (2) $Soil_{ni}$-PEF; (3) $Soil_i$; (4) $Soil_i$-PEF; (5) $Soil_{es}$; (6) GW_1; (7) GW_2; (8) GW_{es}; and (9) GW_{air}. For groundwater, refer to Section G2.0 for additional medium-specific guidelines on adjusting RS for additive health effects. For TPH and lead, refer to Section 3.0 for additional guidelines on adjusting RS for these constituents.

For the derivation of a risk-based RS, a RS is calculated for both carcinogenic and noncarcinogenic health effects and the lower of the two standards is identified as the final risk-based standard. If multiple noncarcinogenic COC are present, then the RS for noncarcinogenic health effects shall be adjusted to account for additive effects prior to comparing it to the carcinogenic RS for the identification of the final risk-based RS.

The **critical effect or target organ/system** identified for addressing additive health effects shall be the critical effect or target organ/system listed as the basis for the RfD and/or RfC in *Integrated Risk Information System* (EPA http://www.epa.gov/iris/) or *Health Effects Assessment Summary Tables* (EPA). The critical effects/target organs for all applicable routes of exposure (ingestion and inhalation) shall be identified. The critical effects/target organs for the COC listed in RECAP Tables 1 - 3 are presented in Table G-1 at the end of this Appendix. Critical effects/target organs are often not available for the RfD issued as provisional values by the EPA's National Center for Environmental Assessment (NCEA). If a critical effect/target organ is not available for a NCEA provisional RfD, then it is not required that the RS based on that provisional RfD be adjusted to account for additive health effects. Provisional RfD used to develop MO-1 RS are footnoted with "E" in Table H-1 of Appendix H of RECAP.

RS that are not risk-based shall not be adjusted to account for additivity. The following RS do not require modification to account for additivity: (1) $Soil_{GW}$ (Note: If the groundwater zone to be protected is currently being used as a drinking water source, then the $Soil_{GW}$ shall be modified to account for additivity.); (2) $Soil_{sat}$; (3) GW_3; (4) $Water_{sol}$; (5) a RS based on an approved quantitation limit; (6) a RS based on an approved background concentration; (7) a RS based on the 10,000 mg/kg upper limit for TPH (refer to Section G3.3); (8) RS for lead (refer to Section G3.2); and (9) a groundwater RS based on an MCL (unless there is actual exposure to COC via groundwater) (refer to Section G2.1).

G2.0 MEDIUM-SPECIFIC GUIDELINES FOR ADDRESSING ADDITIVE HEALTH EFFECTS

G2.1 Groundwater

A GW_1 or GW_2 RS based on a MCL (SDWA) shall not be adjusted to account for additivity unless there is actual exposure to multiple COC via groundwater (i.e., the groundwater is currently being used as a drinking water source). If there is actual exposure to impacted groundwater from an aquifer that meets the definition of Groundwater Classifications 1 or 2, then risk-based RS which account for additivity shall be developed for each COC in accordance with Appendix H. When adjusting the GW_1 or GW_2 to account for additivity, the critical effect/target organ shall be identified for all COC (even those COC for which the MCL serves as the GW_1 or GW_2) whether or not actual exposure to groundwater is occurring.

G2.2 C_{ani} and C_{ai} for GW_{es}, GW_{air}, and $Soil_{es}$

If a GW_{es}, GW_{air}, or $Soil_{es}$ is based on a C_{ani} or C_{ai} that is based on a Louisiana Toxic Air Pollutant Ambient Air Standard eight-hour average or annual average (LAC 33:III.5112) and multiple COC are present, a GW_{es}, GW_{air}, or $Soil_{es}$ shall be calculated for each COC (in accordance with Section H2.3 of Appendix H) based on a C_{ani} or C_{ai} that has been adjusted to account for additive health effects.

G3.0 OTHER CONSIDERATIONS REGARDING ADDITIVE HEALTH EFFECTS

G3.1 Multiple AOI

If there are multiple AOI in close proximity and/or receptor activity patterns involve more than one AOI, then the RS shall be adjusted to account for additive health effects associated with COC present at or originating from all AOI contributing to exposure.

G3.2 Lead

Based on lead's mechanism of toxicity, EPA considers it inappropriate to develop a RfD for lead. Risk-based standards for lead are developed using toxicokinetic models based on acceptable blood lead levels in sensitive receptor populations. Therefore, the risk-based RS for lead is not generally adjusted to account for additive health effects.

G3.3 Total Petroleum Hydrocarbons

10,000 ppm cap. A RS of 10,000 ppm for TPH shall not be adjusted to account for additive health effects. If there is potential for additive health effects, the **risk-based** RS for a TPH fraction or mixture shall be adjusted to account for additivity and then compared to the 10,000 ppm cap. If the adjusted risk-based value is less than 10,000 ppm, then the risk-based value shall serve as the risk-based standard. If the adjusted risk-based value is greater than 10,000 ppm, then the upper limit of 10,000 ppm shall be used as the RS.

TPH Fractions. Each fraction may be treated as an individual COC when accounting for additivity, however, in some situations, this approach may be overly conservative. The RfD for aliphatics $C_{>8}$-C_{16} is based on a mixture of aliphatic hydrocarbons ranging from C_8 to C_{16}. Therefore additivity was inherently accounted for during the toxicity testing and RfD development for the $C_{>8}$-C_{10}, $C_{>10}$-C_{12}, and $C_{>12}$-C_{16} fractions. The same is true for the aromatic factions $C_{>8}$-C_{10}, $C_{>10}$-C_{12}, and $C_{>12}$-C_{16}. When accounting for additivity for the TPH fractions, the following fractions should be treated as individual COC: aliphatics $C_{>6}$-C_8, aliphatics $C_{>8}$-C_{16}, aliphatics $C_{>16}$-C_{35}, aromatics $C_{>8}$-C_{16}, and aromatics $C_{>16}$-C_{35} (refer to soil example 5). Refer to Appendix D, Table D-3 for the critical effects/target organs for the TPH fractions.

G4.0 SCREENING STANDARDS

For **carcinogens**, the Department-derived SS have been calculated based on a target risk level of 10^{-6}. For **noncarcinogens**, SS have been calculated based on a hazard quotient of 0.1 to account for potential additive effects associated with the presence of multiple (10) noncarcinogenic COC (having the same critical effect) at the AOI. **SS do not have to be adjusted to account for additivity.**

G5.0 MO-1 AND MO-2 RECAP STANDARDS

For **carcinogens**, the MO-1 and MO-2 RS are based on a target risk level of 10^{-6} in accordance with EPA guidelines and policy (*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual Part B Development of Risk-Based Preliminary Remediation Goals,* EPA 1991*; Soil Screening Guidance,* EPA 1996*; Role of Baseline Risk Assessment in Superfund Remedy Selection Decisions,* EPA 1991; NCP 40 CFR 300.430(e)(2); *Risk-based Concentration Tables,* EPA Region III; *Preliminary Remediation Goals* EPA Region IX, EPA Region IV; EPA Region VI; and EPA Region VIII). For carcinogens, it is assumed that setting a 10^{-6} risk level for individual constituents and media will generally lead to cumulative risks within the 10^{-4} to 10^{-6} risk range (*Soil Screening Guidance*, EPA 1996). Therefore, since a target risk level of 10^{-6} was used in the development of MO-1 and MO-2 RS, it is generally not necessary to adjust RS that are based on carcinogenic health effects when there is exposure to multiple carcinogens or exposure via multiple media/pathways (RS based on carcinogenic health effects are footnoted with "C" in Tables 2 and 3).

For **noncarcinogens**, the MO-1 and MO-2 RS are based on a target hazard quotient of 1.0 in accordance with EPA guidelines (*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual*, *Part B - Development of Risk-Based Preliminary Remediation Goals,* EPA 1991*; Soil Screening Guidance,* EPA 1996). A hazard quotient of 1.0 corresponds to an acceptable exposure level for exposure to a single constituent via a single medium. The MO-1 and MO-2 risk-based RS, therefore, represent acceptable exposure levels for exposure to a single constituent via a single medium.

The application of MO-1 or MO-2 risk-based RS at a site where multiple constituents are present that have the same critical health effect could result in cumulative exposure that exceeds a hazard index of 1.0 for that effect. To address this concern, the MO-1 and MO-2 risk-based RS for constituents that produce the same noncarcinogenic critical effect shall be modified to account for potential additive health effects associated with exposure to multiple constituents. To identify the risk-based RS requiring modification, the noncarcinogenic COC for the Option currently being implemented shall be grouped according to the critical effect. If more than one noncarcinogenic COC has the same critical effect, the risk-based RS for those COC shall be divided by the number of COC present in the group (*Soil Screening Guidance: User's Guide*, EPA 1996) (refer to the examples provided below).

As an alternative to modifying the RS based on the number of constituents affecting the same critical effect or target organ/system, the MO-2 RS may be modified to account for additive exposures by apportioning the Hazard Index (equal to 1.0) based on site-specific conditions.

In addition, under MO-2, a total hazard index may be calculated to demonstrate that the total hazard index for a given critical effect or target organ/system is less than or equal to 1.0:

Hazard Index = $[(EC_1/RS_1) + (EC_2/RS_2) + \ldots + (EC_i/RS_i)$

where:

EC_i = exposure concentration for the i^{th} COC; and
RS_i = MO-2 limiting RECAP Standard for the i^{th} constituent

If the Hazard Index for a critical effect or target organ/system is > 1.0 under MO-2, then the AOI shall be evaluated further under MO-3 or remediated to MO-2 RS that have been adjusted to account for additive health effects.

The application of MO-2 RS at a site where a receptor is exposed to a COC(s) by more than one medium [e.g., exposure to soil **and** groundwater such as a residential receptor exposed to both impacted soil and impacted drinking water (groundwater meeting the definition of Groundwater Classification 1 and 2)] could result in a hazard index greater than 1.0 for that COC. To modify a RS to account for exposure to a COC via more than one medium, the MO-2 RS for that COC shall be divided by the number of media that contain the COC and to which the receptor is exposed.

As an alternative to modifying the MO-2 RS to account for additive exposures due to multiple media by dividing by the number of media, the MO-2 RS may be apportioned based on site-specific conditions.

Refer below for examples on adjusting MO-1 and MO-2 risk-based RS to account for additivity:

Examples for exposure to multiple constituents:

Soil Example 1

If acetone, styrene, phenol, and chlorobenzene are present in soil, the $Soil_{ni}$ or $Soil_i$ shall be adjusted to account for cumulative effects as follows:

(1) Identify the critical effect or target organs/systems and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For acetone, the target organs/systems include the liver and kidney. For styrene, the target organs/systems include the liver, central nervous system and hematological system. For phenol, the critical effect is decreased weight gain. For chlorobenzene, the target organ/system is the liver.

(2) Summarize by critical effect or target organ/system:

Kidney: acetone
Liver: acetone, styrene, chlorobenzene
CNS: styrene
Hematological system: styrene
Decreased weight gain: phenol

(3) Adjust the $Soil_{ni}$ or $Soil_i$ to account for cumulative effects for each target organ/system:

The $Soil_{ni}$ or $Soil_i$ for acetone, styrene and chlorobenzene should be divided by 3 to account for cumulative effects to the liver due to simultaneous exposure to acetone, styrene and chlorobenzene.

The $Soil_{ni}$ or $Soil_i$ for phenol should be used as it appears in Table 2 since no other constituents present in the soil cause decreased weight gain.

Soil Example 2

If fluoranthene, pyrene, acenaphthene, 2,4-dimethylphenol, cyanide, phenol, 2,4-dichlorophenol, and 2,4,5-trichlorophenol are present in soil, the $Soil_{ni}$ or $Soil_i$ should be adjusted to account for cumulative effects as follows:

(1) Identify the critical effect or target organs/systems and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For fluoranthene, the target organs/systems include the liver, kidney and hematological system. For pyrene the target organ/system is the kidney. For acenaphthene, the target organ/system is the liver. For 2,4-dimethylphenol, the target organs/systems include the central nervous system (CNS) and the hematological system. For cyanide, the critical effect/target organs/systems include weight loss, the thyroid gland, and CNS. For phenol, the critical effect is decreased weight gain. For 2,4-dichlorophenol, the target organ/system is the immune system. For 2,4,5-trichlorophenol, the target organs/systems include the liver and kidney.

(2) Summarize by critical effect or target organ/system:

Kidney: fluoranthene, pyrene and 2,4,5-trichlorophenol
Liver: fluoranthene, acenaphthene and 2,4,5-trichlorophenol
CNS: 2,4-dimethylphenol and cyanide
Hematological System: fluoranthene and 2,4-dimethylphenol
Decreased weight gain/weight loss: phenol and cyanide
Immune System: 2,4-dichlorophenol
Thyroid gland: cyanide

(3) Adjust the $Soil_{ni}$ or $Soil_i$ to account for cumulative effects for each critical effect or target organ/system:

The $Soil_{ni}$ or $Soil_i$ for fluoranthene, pyrene, acenaphthene, and 2,4,5-trichlorophenol should be divided by 3 to account for cumulative effects to the kidney due to simultaneous exposure to fluoranthene, pyrene and 2,4,5-trichlorophenol and to account for cumulative effects to the liver due to simultaneous exposure to fluoranthene, acenaphthene, and 2,4,5-trichlorophenol.

The soil RS for 2,4-dimethylphenol, phenol, and cyanide should be divided by 2 to account for cumulative effects to the CNS due to simultaneous exposure to 2,4-dimethylphenol and cyanide; to account for cumulative effects to the hematological system due to simultaneous exposure to fluoranthene and 2,4-dimethylphenol; and to account for cumulative effects associated with decreased weight gain/weight loss due to simultaneous exposure to phenol and cyanide.

The $Soil_{ni}$ or $Soil_i$ for 2,4-dichlorophenol should be used as it appears in Table 2 since no other constituents present in the soil affect the immune system.

Soil Example 3

If xylene, styrene, endrin and endosulfan are present in subsurface soil beneath an enclosed-space, the $Soil_{es}$ (MO-2) should be adjusted to account for additive effects as follows:

(1) Identify the critical effect or target organs/systems and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For xylene, the target organ/system is the CNS. For styrene, the target organs/systems include the liver, CNS, and the hematological system. For endrin, the target organs/systems include the liver and CNS. For endosulfan, the target organ/system is the kidney.

(2) Summarize by critical effect or target organ/system:

CNS: xylene, styrene, endrin
Liver: styrene, endrin

Hematological System: styrene
Kidney: endosulfan

(3) Adjust the $Soil_{es}$ to account for cumulative effects for each critical effect or target organ/system:

The $Soil_{es}$ for xylene and styrene should be divided by 2 to account for cumulative effects to the CNS due to simultaneous inhalation exposure to xylene and styrene.

The $Soil_{es}$ for endrin and endosulfan should not be considered since they are not volatile and not of concern for this pathway.

Soil Example 4

If toluene, ethylbenzene, xylene (TEX), aliphatics $C_{>6}$-C_8, aliphatics $C_{>8}$-C_{12}, and aromatics $C_{>8}$-C_{12}, are present in soil, the $Soil_{ni}$ or $Soil_i$ shall be adjusted to account for cumulative effects as follows:

(1) Identify the critical effect or target organs/systems (IRIS or HEAST and Appendix H) and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For toluene, the target organs/systems include the liver, CNS, nasal epithelium, and kidney. For ethylbenzene, the target organs/systems include the liver, kidney, and developmental effects. For xylene, the target organ/system and critical effects are the CNS, increased mortality, and decreased body weight. For aliphatics $C_{>6}$-C_8, the kidney is the target organ/system. For aliphatics $C_{>8}$-C_{12}, the liver and hematological system are the target organs/systems. For aromatics $C_{>8}$-C_{12}, decreased body weight is the critical effect.

(2) Summarize by critical effect or target organ/system:

Kidney: toluene, ethylbenzene, aliphatics $C_{>6}$-C_8
Liver: toluene, ethylbenzene, aliphatics $C_{>8}$-C_{12}
CNS: toluene, xylene
Hematological System: aliphatics $C_{>8}$-C_{12}
Body Weight Change: xylene, aromatics $C_{>8}$-C_{12}
Developmental effects: ethylbenzene
Nasal epithelium: toluene
Increased mortality: xylene

(3) Adjust the $Soil_{ni}$ or $Soil_i$ to account for cumulative effects for each critical effect or target organ/system:

The $Soil_{ni}$ or $Soil_i$ for toluene, ethylbenzene, aliphatics $C_{>6}$-C_8, and aliphatics $C_{>8}$-C_{12} should be divided by 3 to account for cumulative effects to the liver due to simultaneous exposure to toluene, ethylbenzene and aliphatics $C_{>8}$-C_{12} and for cumulative effects to the kidney due to simultaneous exposure to toluene, aliphatics $C_{>6}$-C_8, and ethylbenzene.

The $Soil_{ni}$ or $Soil_i$ for xylene and aromatics $C_{>8}$-C_{12} should be divided by 2 to account for cumulative effects on body weight and for cumulative effects to the CNS due to simultaneous exposure to toluene and xylene.

The $Soil_{ni}$ or $Soil_i$ for aliphatics $C_{>8}$-C_{12} should be used as it appears in Table 2 since no other constituents present in the soil affect the hematologic system.

Soil Example 5

If ethylbenzene, aliphatics $C_{>8}$-C_{10}, aliphatics $C_{>10}$-C_{12}, and aliphatics $C_{>12}$-C_{16}, are present in soil, the $Soil_{ni}$ or $Soil_i$ shall be adjusted to account for cumulative effects as follows:

(1) Identify the critical effect or target organs/systems (IRIS or HEAST and Appendix D) and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For ethylbenzene, the target organs/systems include the liver, kidney, and developmental effects. For aliphatics $C_{>8}$-C_{16}, the liver and hematological system are the target organs/systems.

(2) Summarize by critical effect or target organ/system:

Liver: ethylbenzene, aliphatics $C_{>8}$-C_{16}
Kidney: ethylbenzene
Hematological System: aliphatics $C_{>8}$-C_{16}
Developmental effects: ethylbenzene

(3) Adjust the $Soil_{ni}$ or $Soil_i$ to account for cumulative effects for each critical effect or target organ/system:

The $Soil_{ni}$ or $Soil_i$ for ethylbenzene and aliphatics $C_{>8}$-C_{10}, aliphatics $C_{>10}$-C_{12} and aliphatics $C_{>12}$-C_{16} should be divided by 2 to account for cumulative effects to the liver due to simultaneous exposure to ethylbenzene and aliphatics $C_{>8}$-C_{16}.

Groundwater Example 1

If acetone, chlorobenzene, endrin, fluoranthene, and butylbenzylphthalate are present in groundwater meeting the definition of Groundwater Classification 1 or 2 but no exposure points are present and no exposure to impacted groundwater is occurring, the groundwater RS (GW_1 and GW_2) should be adjusted to account for cumulative effects as follows:

(1) Identify the critical effect or target organs/systems and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For acetone, the target organs/systems include the liver and kidney. For chlorobenzene, the target organ/system is the liver. For endrin, the target organs/systems include the liver and CNS. For fluoranthene, the target organs/systems include the liver, kidney, and hematological system. For butylbenzylphthalate, the target organs/systems are the liver and the CNS.

(2) Summarize by critical effect or target organ/system:

Liver: acetone, chlorobenzene, endrin, fluoranthene, and butylbenzylphthalate
Kidney: acetone and fluoranthene
CNS: endrin and butylbenylphthalate
Hematological System: fluoranthene

(3) Adjust the GW_1 and GW_2 to account for cumulative effects for each critical effect or target organ/system:

The GW_1 and GW_2 for acetone, fluoranthene, and butylbenzylphthalate should be divided by 5 to account for cumulative effects to the liver due to simultaneous exposure to acetone, chlorobenzene, endrin, fluoranthene, and butylbenzylphthalate (this also accounts for cumulative effects to the kidney due to simultaneous exposure to acetone and fluoranthene and cumulative effects to the CNS due to simultaneous exposure to endrin and butylbenzylphthalate).

The GW_1 and GW_2 for chlorobenzene and endrin are based on the MCL and since no exposure points are present and no exposure to impacted groundwater is occurring, the groundwater RS (MCL) should be used as presented in Table 3.

Groundwater Example 2

If fluoranthene, pyrene, acenaphthene, 2,4-dimethylphenol, cyanide, phenol, 2,4-dichlorophenol and 2,4,5-trichlorophenol are present in groundwater meeting the definition of Groundwater Classification 1 or 2 **and** an exposure point has been identified (i.e., exposure is occurring), the GW_1 and GW_2 should be adjusted to account for cumulative effects as follows:

(1) Identify the target organs/systems and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For fluoranthene, the target organs/systems include the liver, kidney and hematological system. For pyrene the target organ/system is the kidney. For acenaphthene, the target organ/system is the liver. For 2,4-dimethylphenol, the critical effects/target organs/systems include the hematological system and clinical toxicity. For cyanide, the critical effects/target organs/systems are the CNS, the thyroid gland, and weight loss. For phenol, the critical effect is decreased weight gain. For 2,4-dichlorophenol, the target organ/system is the immune system. For 2,4,5-trichlorophenol, the target organs/systems include the liver and kidney.

(2) Summarize by critical effect or target organ/system:

Kidney: fluoranthene, pyrene and 2,4,5-trichlorophenol
Liver: fluoranthene, acenaphthene and 2,4,5-trichlorophenol
CNS: cyanide
Hematological System: fluoranthene and 2,4-dimethylphenol
Decreased weight gain/weight loss: cyanide and phenol
Immune System: 2,4-dichlorophenol
Clinical toxicity: 2,4-dimethylphenol
Thyroid gland: cyanide

(3) Adjust the GW_1 and GW_2 to account for cumulative effects for critical effect or target organ/system:

The GW_1 and GW_2 for fluoranthene, pyrene, acenaphthene, and 2,4,5-trichlorophenol should be divided by 3 to account for cumulative effects to the kidney due to simultaneous exposure to fluoranthene, pyrene and 2,4,5-trichlorophenol and to account for cumulative effects to the liver due to simultaneous exposure to fluoranthene, acenaphthene, and 2,4,5-trichlorophenol.

The GW_1 and GW_2 for 2,4-dimethylphenol, phenol, and cyanide should be divided by 2 to account for cumulative effects to the hematological system due to simultaneous exposure to fluoranthene and 2,4-dimethylphenol and to account for cumulative effects associated with decreased weight gain/weight loss due to simultaneous exposure to phenol and cyanide.

The GW_1 and GW_2 for 2,4-dichlorophenol should be used as they appear in Table 3 since no other constituents present in the groundwater affect the immune system.

A GW_1 or GW_2 for cyanide should be developed to account for additive effects since: (1) the GW_1/ GW_2 is based on the MCL, (2) there is actual exposure to the groundwater, and (3) there is more than one constituent in the groundwater that elicits noncarcinogenic effects on the CNS.

Groundwater Example 3

If nitrobenzene, 2,4,5-trichlorophenol and barium are present in groundwater meeting the definition of Groundwater Classification 3, the GW_3 should be used as it appears in Table 3. The GW_3 RS is based on the prevention of cross-media transfer (i.e., groundwater discharge to surface water). Therefore, these RS are not adjusted to account for additivity.

Groundwater Example 4

If acetone, styrene, endrin, and chlorobenzene are present in groundwater located beneath an enclosed-space, the GW_{es} should be adjusted to account for cumulative effects as follows:

(1) Identify the critical effect or target organs/systems and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For acetone, the target organs/systems include the liver and kidney. For endrin, the target organs/systems include the liver and CNS. For phenol, the critical effect is decreased weight gain. For chlorobenzene, the target organ/system is the liver.

(2) Summarize by critical effect or target organ/system:

Kidney: acetone
Liver: acetone, endrin, chlorobenzene
CNS: endrin
Decreased weight gain: phenol

(3) Adjust the GW_{es} to account for cumulative effects for each critical effect or target organ/system:

The GW_{es} for acetone and chlorobenzene should be divided by 2 to account for cumulative effects to the liver due to simultaneous exposure to acetone and chlorobenzene.

The GW_{es} for phenol should be used as it appears in Table 3 or as calculated under MO-2 since no other constituents present in the groundwater cause decreased weight gain.

Endrin should not be considered for this pathway because it is not volatile.

Groundwater Example 5

If toluene, ethylbenzene, xylene (TEX), aliphatics $C_{>6}$-C_8, aliphatics $C_{>8}$-C_{12}, and aromatics $C_{>8}$-C_{12} are present in groundwater meeting the definition of Groundwater

Classification 1 or 2 but no exposure points are present and no exposure to impacted groundwater is occurring, the groundwater RS (GW_1 and GW_2) should be adjusted to account for cumulative effects as follows:

(1) Identify the critical effect or target organs/systems (IRIS or HEAST) and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For toluene, the target organs/systems include the liver, nasal epithelium, CNS, and kidney. For ethylbenzene, the target organs/systems include the liver, kidney, and developmental effects. For xylene, the target organ and critical effects include the CNS, increased mortality, and decreased body weight. For aliphatics $C_{>6}$-C_8, the kidney is the target organ/system. For aliphatics $C_{>8}$-C_{12}, the liver and hematologic system are the target organs/systems. For aromatics $C_{>8}$-C_{12}, decreased body weight is the critical effect.

(2) Summarize by critical effect or target organ/system:

Kidney: toluene, ethylbenzene, aliphatics $C_{>6}$-C_8
Liver: toluene, ethylbenzene, aliphatics $C_{>8}$-C_{12}
CNS: toluene, xyleneHematologic System: aliphatics $C_{>8}$-C_{12}
Body Weight Change: xylene, aromatics $C_{>8}$-C_{12}
Developmental effects: ethylbenzene
Nasal epithelium: toluene
Increased mortality: xylene

(3) Adjust the GW_1 and GW_2 to account for cumulative effects for each critical effect or target organ/system:

The GW_1 and GW_2 for ethylbenzene, toluene and xylene are based on the MCL and since no exposure points are present and no exposure to impacted groundwater is occurring, the groundwater RS (MCLs) should be used as presented in Table 3.

The GW_1 and GW_2 for aliphatics $C_{>6}$-C_8 and aliphatics $C_{>8}$-C_{12} should be divided by 3 to account for cumulative effects to the liver due to simultaneous exposure to toluene, ethylbenzene, and aliphatics $C_{>8}$-C_{12} and to account for cumulative effects to the kidney due to simultaneous exposure to toluene, ethylbenzene, and aliphatics $C_{>6}$-C_{10}.

The GW_1 and GW_2 for aromatics $C_{>8}$-C_{12} should be divided by 2 to account for cumulative effects on body weight due to simultaneous exposure to xylene and aromatics $C_{>8}$-C_{12}.

Example for exposure to more than one medium:

- toluene, ethylbenzene and xylene are present in the soil;
- toluene and xylene are present in groundwater meeting the definition of Groundwater Classification 1 or 2; and
- the receptor is being exposed to both impacted soil and impacted groundwater meeting the definition of Groundwater Classification 1 or 2 [an exposure point has been identified (a water supply well) and exposure is occurring].

(1) **Adjust for exposure to multiple constituents**

(a) Identify the critical effect or target organs/systems (IRIS or HEAST) and group the constituents according to the critical effect or target organ/system on which the RfD (RfC) is based.

For toluene, the target organs/systems include the liver, nasal epithelium, CNS, and kidney. For ethylbenzene, the target organs/systems include the liver, kidney, and developmental effects. For xylene, the target organ and critical effects include the CNS, increased mortality, and decreased body weight.

(b) Summarize by critical effect or target organ/system:

Kidney: toluene, ethylbenzene
Liver: toluene, ethylbenzene
CNS: toluene, xylene
Body Weight Change: xylene
Developmental effects: ethylbenzene
Nasal epithelium: toluene
Increased mortality: xylene

(c) Adjust the RS to account for cumulative effects for each critical effect or target organ/system:

The $Soil_{ni}$ or $Soil_i$ for toluene, ethylbenzene should be divided by 2 to account for cumulative effects to the liver and the kidney due to simultaneous exposure to toluene and ethylbenzene.

The $Soil_{ni}$ or $Soil_i$ for xylene should be divided by 2 to account for cumulative effects to the CNS due to simultaneous exposure to xylene and toluene.

The GW_1 or GW_2 for toluene and xylene should be divided by 2 to account for cumulative effects to the CNS due to simultaneous exposure to xylene and toluene.

(2) **Adjust for exposure to more than one medium**

The $Soil_i$ or $Soil_{ni}$, for toluene and xylene should be adjusted to account for cumulative effects by dividing the RS identified in Step 1.c by 2.

The GW_1 or GW_2 for toluene and xylene should be adjusted to account for cumulative effects by dividing the RS identified in Step 1.c by 2.

Example of calculating a Hazard Index using RS:

Acetone (300 mg/kg), styrene (420 mg/kg), phenol 30,000 (mg/kg), and chlorobenzene (31 mg/kg) were detected in soil at an industrial site. The MO-2 $Soil_i$ RS are 1400 mg/kg for acetone, 1700 mg/kg for styrene, 24,000 mg/kg for phenol, and 120 mg/kg for chlorobenzene. Identification of the critical effects/target organs indicates that acetone, styrene, and chlorobenzene all elicit noncarcinogenic effects on the liver.

Hazard Index = $[(EC_1/RS_1) + (EC_2/RS_2) + \ldots + (EC_i/RS_i)$

where:
EC_i = exposure concentration for the i^{th} COC; and
RS_i = MO-2 limiting RECAP Standard for the i^{th} constituent

The Hazard Index for the liver (acetone, styrene, and chlorobenzene) = 300/1400 + 420/1700 + 31/120 = 0.72. The Hazard Index for the liver is 0.72 which is less than 1.0, therefore, no further action is warranted at this time for these constituents.

The Hazard Index for phenol = 30,000/24,000 = 1.25. The Hazard Index for phenol is 1.25 which is greater than 1.0, therefore, this COC shall be further evaluated under MO-3 or remediated to the MO-2 RS.

G6.0 MO-3 RECAP STANDARDS

For **carcinogens**, it is assumed that the development of site-specific RS based on a target risk level o 10^{-6} for individual constituents will generally lead to a cumulative cancer risk within the acceptable risk range of 10^{-6} to 10^{-4} (*Soil Screening Guidance*, EPA 1996). Therefore, a target risk level of 10^{-6} shall be used in the development of MO-3 RS unless otherwise approved by the Department. Refer to Section 2.14 for further information on acceptable cancer risk levels under MO-3.

For **noncarcinogens,** the target hazard index of 1.0 shall be apportioned to account for additive health effects based on site-specific conditions. The target hazard index (or RS) shall be modified to account for additive health effects associated with: 1) exposure to more than one constituent that has the same critical effect as defined by the RfD and/or RfC; 2) exposure to more than one environmental medium that contains the same COC; 3) exposure via multiple pathways; and/or 4) exposure to constituents present at one or more AOI (if appropriate based on the proximity of multiple AOI, the COC/exposure pathways present, and/or receptor activity patterns).

TABLE G-1
Critical Effects and Target Organs/Systems [1]

CONSTITUENT	CAS #	CRITICAL EFFECT(S)/TARGET ORGAN(S) [2]
Acenaphthene	83-32-9	Liver toxicity
Acetone	67-64-1	Liver effects (increased weight); Kidney toxicity
Aldrin	309-00-2	Liver toxicity
Aniline	62-53-3	Spleen toxicity
Anthracene	120-12-7	No observed effects
Antimony	7440-36-0	Decreased longevity; Decreased blood glucose; Altered blood cholesterol levels
Arsenic	7440-38-2	Skin effects (hyperpigmentation and keratosis); Vascular effects
Barium	7440-39-3	Kidney effects (increased weight)
Benzene	71-43-2	Bone marrow toxicity (lymphocytopenia) [3]
Benz(a)anthracene	56-55-3	NA [4]
Benzo(a)pyrene	50-32-8	NA
Benzo(b)fluoranthene	205-99-2	NA
Benzo(k)fluoranthene	207-08-9	NA
Beryllium	7440-41-7	Gastrointestinal effects (erosion and inflammatory lesions); Beryllium sensitization; Respiratory system (chronic beryllium disease - chronic inflammatory lung disease)
Biphenyl,1,1-	92-52-4	Kidney toxicity
Bis(2-chloroethyl)ether	111-44-4	NA
Bis(2-chloroisopropyl)ether	108-60-1	Hematological system effects (red blood cell toxicity/destruction and decreased hemoglobin)
Bis(2-ethyl-hexyl)phthalate	117-81-7	Liver effects (increased weight)
Bromodichloromethane	75-27-4	Kidney effects (cytomegaly)
Bromoform	75-25-2	Liver effects
Bromomethane	74-83-9	Gastrointestinal effects (epithelial hyperplasia of stomach); Nasal cavity effects (degeneration and proliferative lesions of the olfactory epithelium)
Butyl benzyl phthalate	85-68-7	Liver effects (increased weight); CNS effects (increased brain weight)
Cadmium	7440-43-9	Kidney effects (proteinuria)
Carbon Disulfide	75-15-0	Fetal toxicity (malformations); Peripheral nervous system dysfunction
Carbon Tetrachloride	56-23-5	Liver toxicity
Chlordane	57-74-9	Liver toxicity (necrosis)
Chloroaniline,p-	106-47-8	Spleen effects (capsular lesions)
Chlorobenzene	108-90-7	Liver effects
Chlorodibromomethane	124-48-1	Liver effects
Chloroethane (Ethylchloride)	75-00-3	Fetal toxicity (delayed ossification)
Chloroform	67-66-3	Liver effects (fatty cyst formation; increased SGPT)
Chloromethane (Methyl chloride)	74-87-3	CNS (cerebellar lesions)
Chloronaphthalene,2-	91-58-7	Liver (increased weight); Respiratory effects (dyspnea)
Chlorophenol,2-	95-57-8	Reproductive effects (increased conceptions, increased stillbirths, decreased litter size)
Chromium(III)	16065-83-1	No observed effects
Chromium(VI)	18540-29-97	Aerosols: Nasal cavity effects (septum atrophy); Dusts: Lower respiratory system toxicity
Chrysene	218-01-9	NA
Cobalt	7440-48-4	NA

CONSTITUENT	CAS #	CRITICAL EFFECT(S)/TARGET ORGAN(S) [2]
Copper	7440-50-8	Gastrointestinal effects (irritation)
Cyanide (free)	57-12-5	Weight loss; Thyroid gland effects; Nervous system effects (myelin degeneration)
DDD	72-54-8	NA
DDE	72-55-9	NA
DDT	50-29-3	Liver effects
Dibenz(a,h)anthracene	53-70-3	NA
Dibenzofuran	132-64-9	NA
Dibromo-3-chloropropane,1,2-	96-12-8	Reproductive system effects (decreased sperm count and decreased number of live sperm)
Dichlorobenzene,1,2-	95-50-1	No observed effects
Dichlorobenzene,1,3-	541-73-1	NA
Dichlorobenzene,1,4-	106-46-7	Liver effects (increased weight)
Dichlorobenzidine,3,3-	91-94-1	NA
Dichloroethane,1,1-	75-34-3	No observed effects
Dichloroethane,1,2-	107-06-2	NA
Dichloroethene ,1,1-	75-35-4	Liver toxicity (fatty change)
Dichloroethene,cis,1,2-	156-59-2	Hematological effects (decreased hemoglobin and hematocrit)
Dichloroethene,trans,1,2-	156-60-5	Liver effects (increased serum alkaline phosphatase)
Dichlorophenol,2,4-	120-83-2	Immune system effects (altered immune function)
Dichloropropane,1,2-	78-87-5	Nasal cavity effects (epithelial hyperplasia)
Dichloropropene,1,3-	542-75-6	Gastrointestinal effects (irritation); Nasal cavity effects (hyperplasia and hypertrophy of epithelium)
Dieldrin	60-57-1	Liver effects
Diethylphthalate	84-66-2	Decreased growth rate; Decreased food consumption; Altered organ weights
Dimethylphenol,2,4-	105-67-9	Hematological effects; Clinical signs of toxicity (lethargy, ataxia, and prostration)
Dimethylphthalate	131-11-3	NA
Di-n-octylphthalate	117-84-0	NA
Dinitrobenzene,1,3-	99-65-0	Spleen effects (increased weight)
Dinitrophenol,2,4-	51-28-5	Ocular effects (cataract formation)
Dinitrotoluene,2,6-	606-20-2	Central nervous system effects; Hematological effects; Biliary system effects; Kidney effects; Decreased longevity
Dinitrotoluene,2,4-	121-14-2	Central nervous system toxicity; Biliary system effects; Hematological system effects
Dinoseb	88-85-7	Fetal effects (decreased weight)
Endosulfan	115-29-7	Decreased growth rate; Kidney effects (glomerulonephrosis); Vascular system effects (aneurysms)
Endrin	72-20-8	Liver effects; Central nervous system effects (stimulation/convulsions)
Ethyl benzene	100-41-4	Liver toxicity; Kidney toxicity; Fetal effects (skeletal abnormalities)
Fluoranthene	206-44-0	Kidney effects; Liver effects; Hematological effects
Fluorene	86-73-7	Hematological effects
Heptachlor	76-44-8	Liver effects
Heptachlor epoxide	1024-57-3	Liver effects
Hexachlorobenzene	118-74-1	Liver effects
Hexachlorobutadiene	87-68-3	Kidney effects
Hexachlorocyclohexane,alpha	319-84-6	NA
Hexachlorocyclohexane,beta	319-85-7	NA

CONSTITUENT	CAS #	CRITICAL EFFECT(S)/TARGET ORGAN(S) [2]
Hexachlorocyclohexane,gamma	58-89-9	Liver effects; Kidney effects
Hexachlorocyclopentadiene	77-47-4	Gastrointestinal effects (chronic irritation); Suppurative inflammation of nose
Hexachloroethane	67-72-1	Kidney effects
Indeno(1,2,3-cd)pyrene	193-39-5	NA
Isobutyl alcohol	78-83-1	Central nervous system effects (hypoactivity and ataxia)
Isophorone	78-59-1	Kidney effects
Lead (inorganic)	7439-92-1	NA
Mercury (inorganic)	7439-97-6	Central nervous system effects
Methoxychlor	72-43-5	Reproductive effects (increased loss of litters)
Methylene chloride	75-09-2	Liver effects
Methyl ethyl ketone	78-93-3	Fetal effects (decreased birth weight)
Methyl isobutyl ketone	108-10-1	Fetal effects (decreased body weight, skeletal effects, increased mortality)
MTBE (methyl tert-butyl ether)	1634-04-4	Liver effects (increased weight); Kidney (increased weight); Ocular effects (swelling of periocular tissues)
Naphthalene	91-20-3	Decreased body weight; Nasal cavity effects (epithelial hyperplasia and olfactory epithelial metaplasia)
Nickel	7440-02-0	NA
Nitrate	14797-55-8	Hematological system effects (methemoglobin formation in infants)
Nitrite	14797-65-0	Hematological system effects (methemoglobin formation in infants)
Nitroaniline,2-	88-74-4	Hematological system effects
Nitroaniline,3-	99-09-2	NA
Nitroaniline,4-	100-01-6	NA
Nitrobenzene	98-95-3	Hematological system effects; Adrenal gland effects; Kidney effects; Liver toxicity
Nitrophenol,4-	100-02-7	NA
Nitrosodi-n-propylamine,n-	621-64-7	NA
N-nitrosodiphenylamine	86-30-6	NA
Pentachlorophenol	87-86-5	Liver effects; Kidney effects
Phenol	108-95-2	Decreased weight gain
Polychlorinated biphenyls	1336-36-3	Aroclor 1016: Fetal effects (decrease birth weight) Aroclor 1248: NA Aroclor 1254: Ocular effects; Immune system effects; Integument effects (distorted growth of nails) Aroclor 1260: NA
Pyrene	129-00-0	Kidney effects
Selenium	7782-49-2	Integument effects (hair loss, nail loss, nail abnormalities, skin lesions); Dental effects; Hematological effects (decreased hemoglobin); Central nervous system effects
Silver	7440-22-4	Skin effects (argyria)
Styrene	100-42-5	Hematological system effects (heinz body formation); Liver effects; Central nervous system effects (decreased intellectual function; decreased memory; and decreased reaction time)
Tetrachlorobenzene,1,2,4,5-	95-94-3	Kidney effects
Tetrachloroethane,1,1,1,2-	630-20-6	Kidney effects; Liver effects
Tetrachloroethane,1,1,2,2-	79-34-5	NA
Tetrachloroethylene	127-18-4	Liver effects
Tetrachlorophenol,2,3,4,6-	58-90-2	Liver toxicity
Thallium	7440-28-0	Liver effects
Toluene	108-88-3	Liver effects (change in weight); Kidney effects (change in weight); Central nervous system effects (decreased concentration-

CONSTITUENT	CAS #	CRITICAL EFFECT(S)/TARGET ORGAN(S) [2]
		response relationship); Nasal cavity (degeneration of epithelium)
Toxaphene	8001-35-2	NA
Trichlorobenzene,1,2,4-	120-82-1	Adrenal gland effects; Liver effects (weight change)
Trichloroethane,1,1,1-	71-55-6	NA
Trichloroethane,1,1,2-	79-00-5	Liver effects
Trichloroethene	79-01-6	CNS effects; Liver effects; Endocrine system effects; Kidney effects; Fetal effects [3]
Trichlorofluoromethane	75-69-4	Decreased longevity; Respiratory system effects (pleuritis); Cardiac system effects (pericarditis)
Trichlorophenol,2,4,5-	95-95-4	Liver effects; Kidney effects
Trichlorophenol,2,4,6-	88-06-2	NA
Vanadium	7440-62-2	Increased mortality
Vinyl chloride	75-01-4	Liver effects (cellular polymorphism)
Xylene (mixed)	1330-20-7	Central nervous system effects (impaired motor coordination); Decreased body weight; Decreased longevity
Zinc	7440-66-6	Hematological system effects (decreased erythrocyte superoxide dismutase in red blood cells)
Aliphatics C6-C8	NA	Kidney effects
Aliphatics >C8-C16	NA	Liver effects; Hematological system effects
Aliphatics >C16-C35	NA	Liver effects
Aromatics >C8-C16	NA	Decreased body weight
Aromatics >C16-C35	NA	Kidney effects

[1]Data were obtained from EPA's Integrated Risk Information System and Health Effects Assessment Summary Tables; includes target organs/critical effects for the ingestion and inhalation routes of exposure (where available).

[2]The target organs/critical effects on which the reference dose(s) is based.

[3]NCEA; RAIS June 2003.

[4]Not applicable or not available.

APPENDIX H

METHODS FOR THE DEVELOPMENT, IDENTIFICATION, AND APPLICATION OF SCREENING STANDARDS AND MO-1, MO-2, AND MO-3 RECAP STANDARDS

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H1.0 IDENTIFICATION/DEVELOPMENT AND APPLICATION OF THE SCREENING STANDARDS AND MO-1, MO-2, AND MO-3 RECAP STANDARDS

This appendix presents the methods for the identification/development and application of the Screening Standards and the MO-1, MO-2, and MO-3 RECAP Standards for soil and groundwater. Methods for the development and application of MO-3 RS for other media and/or pathways shall be: 1) identified/derived by the Submitter; 2) consistent with current EPA risk assessment guidance and recommendations; and 3) subject to Department approval.

H1.1 Soil Standards

Screening Option Overview:

1. Identify the $Soil_{SSni}$ or $Soil_{SSi}$ and $Soil_{SSGW}$ in Table 1;

2. Identify the lower of the two values as the limiting soil SS; and

3. Compare the limiting soil SS to the maximum concentration detected at the AOC.

Management Option 1 Overview:

1. Identify the $Soil_{ni}$ or $Soil_{i}$, $Soil_{GW}$ (multiply by a DF2 or DF3 if applicable), and $Soil_{sat}$ in Table 2.

2. If the soil is present at < 15 ft bgs, contains a volatile COC, and an enclosed structure is present over the AOI, identify the $Soil_{es}$ in Table 2;

3. Identify the lowest of the these values as the limiting soil RS; and

4. Compare the limiting soil RS to the lower of the maximum detected concentration and the 95%UCL-AM concentration.

Management Options 2 and 3 Overview:

1. Calculate a site-specific $Soil_{ni}$ or $Soil_{i}$, $Soil_{GW}$ (multiply by a DAF2 or DAF3 if applicable), and $Soil_{sat}$.

2. If the soil is present at < 15 ft bgs, contains a volatile COC, and an enclosed structure is present over the AOI, calculate a $Soil_{es}$;

3. Identifiy the lowest of these values as the limiting soil RS; and

4. Compare the limiting soil RS to the lower of the maximum detected concentration and the 95%UCL-AM concentration.

Detailed guidance on the identification and application of the SS and RS is presented in the following sections.

H1.1.1 Screening Option

The soil SS include $Soil_{SSni}$, $Soil_{SSi}$, $Soil_{SSGW}$, and $Soil_{sat}$ (refer to Section 2.12). The $Soil_{SSni}$, $Soil_{SSi}$, and $Soil_{SSGW}$ are presented in Table 1 of the main document [$Soil_{sat}$ is not listed in Table 1. The $Soil_{SSni}$, $Soil_{SSi}$, and $Soil_{SSGW}$ were compared to the $Soil_{sat}$ (where appropriate) and the lower of the two values was entered in Table 1.] For a constituent not included in Table 1, the Submitter shall calculate a $Soil_{SSni}$ or $Soil_{SSi}$, $Soil_{SSGW}$, and $Soil_{sat}$ in acccordance with Section H2.1. The SS shall be calculated using: 1) the spreadsheet located at http://www.deq.state.la.us/technology/recap/; or 2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. The toxicity and chemical-specific values shall be obtained using the hierarchy of references listed in Table H-3. Screening Standards shall only be developed for the exposure pathways, exposure scenarios, and land uses included in Appendix H. Site-specific data [with the exception of the area (acres) of impacted soil] shall **not** be used in the development of a soil SS. For a non-detect result, the SQL shall be compared to the limiting SS to document that the SQL is less than or equal to the limiting SS prior to eliminating the constituent from further evaluation under RECAP.

To evaluate soil under the Screening Option:

(1) Identify the AOIC (i.e., the maximum COC concentration detected in soil in the most heavily impacted area(s) known or suspected to be present within the AOC);

(2) Refer to Table 1. Identify the $Soil_{SSni}$ for non-industrial land use or $Soil_{SSi}$ for industrial/commerical land use. If a COC is not listed in Table 1, calculate a $Soil_{SSni}$ (EQ1-EQ4) or $Soil_{SSi}$ (EQ16-EQ19) and a $Soil_{sat}$ (EQ38);

(3) Evaluate the soil to groundwater pathway using either the $Soil_{SSGW}$ in Table 1 or a leach test.

If using the $Soil_{SSGW}$ to evaluate the soil to groundwater pathway:

(a) Refer to Table 1. Identify the $Soil_{SSGW}$. If a COC is not listed in Table 1, calculate a $Soil_{SSGW}$ in accordance with Section H2.1.4.1. Note: Even though the $Soil_{SSGW}$ is based on the protection of a groundwater 1 zone, it is applicable to the protection of **all** groundwater zones under the SO.

(b) Compare: (1) the $Soil_{SSni}$ or $Soil_{SSi}$ and (2) $Soil_{SSGW}$; select the lower of the two values as the limiting SS. For a COC not included in Table 1, compare: (1) the $Soil_{SSni}$ or $Soil_{SSi}$, (2) the $Soil_{SSGW}$, and (3) the $Soil_{sat}$ calculated using EQ38, and select the lowest of the three values as the limiting SS;

(c) Compare the limiting SS to the AOIC:

If the AOIC detected for a COC exceeds the limiting SS, then the soil shall be assessed under a Management Option or the soil shall be remediated to the limiting SS.

If the AOIC for all COC detected in soil are less than the limiting SS, then typically, no further evaluation of the soil is warranted.

If using a leach test to evaluate the soil to groundwater pathway:

(a) Conduct a leach test (e.g., SPLP) in accordance with Appendix B;

(b) Identify the GW_1 in Table 3 and multiply the value by 20 (default value for $DF_{Summers}$). If a COC is not listed in Table 3, determine the GW_1 in accordance with Section H1.2.2.1;

(c) Compare the leach test results to the product of GW_1 x 20:

If the leach test results for all COC are less than or equal to the GW_1 x 20, then the COC concentrations in the soil are protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the GW_1 x 20, then the COC concentration in the soil may not be protective of groundwater and further evaluation of the soil to groundwater pathway is required under a MO or the soil shall be remediated to the $Soil_{SSGW}$.

(d) Compare the AOIC identified in Step (1) with the $Soil_{SSni}$ or $Soil_{SSi}$ (if the COC was not listed in Table 1, compare the $Soil_{SSni}$ or $Soil_{SSi}$ to the $Soil_{sat}$ and then compare the lower of the two values to the AOIC):

If the AOIC for all COC detected in soil are less than the limiting SS, then typically, no further evaluation of the soil is warranted for direct exposure to the soil.

If the AOIC detected for a COC exceeds the limiting SS, then the soil shall be assessed under a Management Option or the soil shall be remediated to the limiting SS.

If the limiting $Soil_{SS}$ calculated by the Submitter is less than the background concentration (as approved by the Department, refer to Section 2.13), then the background concentration shall be identified as the $Soil_{SS}$.

If the limiting $Soil_{SS}$ calculated by the Submitter is less than a Department-approved analytical quantitation limit, then the analytical quantitation limit shall be identified as the $Soil_{SS}$. The analytical quantitation limit identified for application as the $Soil_{SS}$ shall be the lowest quantitation limit available by routine analysis and shall be approved by the Department prior to use.

In applying the limiting SS for TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in soil shall not exceed 10,000 mg/kg (i.e., the sum of the residual concentrations of the TPH fractions and mixtures shall not exceed 10,000 mg/kg). Refer to Appendix D (Page D-TPH-3) for further guidance on addressing petroleum hydrocarbon releases.

If the Department determines that impacted soil is a source medium only (exposure to impacted soil is not likely based on current or future land use and site-specific conditions), then it shall not be required that the risk-based standard for soil ($Soil_{SSni}$ or $Soil_{SSi}$) be considered in the identification of the limiting screening standard.

Application of SO soil SS shall not result in soil that exhibits hazardous waste characteristics of ignitability, corrosivity or reactivity as defined in the Hazardous Waste Regulations (LAC 33:V).

Refer to Section 3.0 of the main document for further guidance on the screening process.

For the generation of Table 1, the $Soil_{SSni}$, $Soil_{SSi}$, and $Soil_{SSGW}$ were each compared to the $Soil_{sat}$ (where applicable) and the lower of the two values was entered in Table 1 as the soil SS. The analytical quantitation limit was presented as the SS in Table 1 when the $Soil_{SSni}$, $Soil_{SSi}$, $Soil_{SSGW}$, or $Soil_{sat}$ was less than the analytical quantitation limit. The toxicity and chemical-specific values used to calculate the SS are presented in Tables H-1 and H-2. The hierarchies of references used to obtain the toxicity and chemical-specific parameters are presented in Table H-3. The SQL values used in Table 1 are presented in Table H-4. The worksheets for the development of the SS are presented at the end of this Appendix.

The procedures used in the development of the soil screening standards are illustrated in Figures 10 and 11.

H1.1.2 Management Option 1

The MO-1 soil RS include $Soil_{ni}$, $Soil_i$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, $Soil_{es}$, and $Soil_{sat}$ (refer to Section 2.12). The soil RS are presented in Table 2 of the main document. For a constituent not included in Table 2, the Submitter shall calculate a $Soil_{ni}$ or $Soil_i$, $Soil_{es}$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$, and $Soil_{sat}$ in accordance with Section H2.1. The MO-1 RS and AOIC shall be calculated using: 1) the spreadsheets located at http://www.deq.state.la.us/technology/recap/; or 2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. MO-1 RECAP Standards shall only be developed for the exposure pathways, exposure scenarios, and land uses defined in Section 2.12. Site-specific data shall **not** be used in the development of a soil MO-1 RS. For a non-detect result, the SQL shall be compared to the limiting MO-1 RS to document that the SQL is less than or equal to the limiting RS prior to eliminating the constituent from further evaluation under the RECAP. If the release of volatile emissions from soil (< 15 ft bgs) to an enclosed structure is a pathway of concern at the AOI, include the $Soil_{es}$ from Table 2 in the identification of the limiting soil RS. For detailed guidance on the application of the $Soil_{es}$ RS refer to Section H1.1.3.4. Note: Indoor air sampling shall **not** be used under

MO-1 for the evaluation of the volatile emissions from soil to an enclosed structure pathway.

For the evaluation of soil using $Soil_{ni}$ or $Soil_i$, $Soil_{GW}$, and $Soil_{sat}$, follow the guidelines in Section H1.1.2.1.

For the evaluation of soil using a leach test instead of the $Soil_{GW}$, follow the guidelines in Section H1.1.2.2.

H1.1.2.1 Evaluation of Soil using MO-1 RECAP Standards ($Soil_{ni}$ or $Soil_i$, $Soil_{GW}$, and $Soil_{sat}$)

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9. Identify the appropriate risk-based RS ($Soil_{ni}$ for non-industrial land use or $Soil_i$ for industrial land use) in Table 2. If more than one COC identified for MO-1 elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G. If a COC is not listed in Table 2, then the Submitter shall calculate a $Soil_{ni}$ (EQ1-EQ4) or a $Soil_i$ (EQ16-EQ19);

(2) Determine the soil concentration protective of groundwater standard ($Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) based on the classification of the groundwater to be protected (refer to Section 2.10 for the Groundwater Classifications) as presented below.

If the groundwater to be protected meets the criteria for Groundwater Classification 1:

Identify the $Soil_{GW1}$ value presented in Table 2. If a COC is not listed in Table 2, then the Submitter shall calculate a $Soil_{GW1}$ in accordance with Section H2.1.4.2.

If the groundwater to be protected meets the criteria for Groundwater Classification 2:

(a) Identify the $Soil_{GW2}$ value presented in Table 2. If a COC is not listed in Table 2, then the Submitter shall calculate a $Soil_{GW2}$ in accordance with Section H2.1.4.2.

(b) If the $Soil_{GW2}$ value in Table 2 is footnoted with DF2, identify the longitudinal dilution factor (DF2) to be applied to the $Soil_{GW2}$ from the table below based on: (1) the shortest distance between the POC and the nearest downgradient property boundary (POE); and (2) the thickness of the groundwater source (S_d). (The S_d is defined as the thickness of the impacted groundwater within the permeable zone; refer to Section H2.5, EQ66 and Figure H-1.) If the S_d is greater than 20 feet then a site-specific DAF shall be calculated under MO-2 or MO-3. If the distance from the source is greater than 2000 feet, then: (1) the DF2 for 2000 feet may be used under MO-1; or (2) a site-specific DAF may be calculated under MO-2 or MO-3 (refer to Section H2.5). **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented below are not valid and shall not be used. The Submitter may develop a site-specific DAF2 under MO-3;

Distance from POC to POE (feet)	MO-1 Longitudinal DF2 (dimensionless)			
	$S_d \leq 5$ ft	S_d = 6-10 ft	S_d = 11-15 ft	S_d = 16-20 ft
0 - 50	1.5	1	1	1
51 - 100	2.6	1.5	1.2	1.1
101 - 150	4.1	2.1	1.6	1.3
151 - 250	8.4	4.3	3	2.3
251 - 500	29	15	9.8	7.4
501 - 750	63	32	21	16
751 - 1000	111	57	37	28
1001 - 1250	173	86	58	43
1251 - 1500	248	124	83	62
1501 - 1750	337	169	113	84
1751 - 2000	440	220	147	110

(c) If the $Soil_{GW2}$ in Table 2 is footnoted with a DF2, multiply the $Soil_{GW2}$ value identified in Step (a) by the longitudinal DF2 identified in Step (b). If the $Soil_{GW2}$ in Table 2 is not footnoted with a DF2, then do not multiply by the DF2. If the $Soil_{GW2}$ (after multiplying by the DF2) for a COC is less than the $Soil_{GW1}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ standard. A DF shall not be applied to the $Soil_{GW1}$ RS.

If the groundwater to be protected meets the criteria for Groundwater Classification 3:

(a) Identify the nearest surface water body (segment or subsegment) downgradient of the soil AOI;

(b) Determine if the surface water body (segment or subsegment) is classified as a drinking water supply ($Soil_{GW3DW}$) or a non-drinking water supply ($Soil_{GW3NDW}$) (LAC 33:IX.Chapter 11) and identify the appropriate $Soil_{GW}$ in Table 2. If a COC is not listed in Table 2, the Submitter shall calculate a $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ in accordance with Section H2.1.4.2.

(c) If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ in Table 2 is footnoted with a DF3, identify the longitudinal dilution factor (DF3) to be applied to the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ from the table below based on: (1) the shortest distance between the POC and the nearest downgradient surface water body (POE) identified in Step (a); and (2) the thickness of the groundwater source (S_d). (The S_d is defined as the thickness of the impacted groundwater within the permeable zone; refer to Section H2.5, EQ66 and Figure H-1.) If the S_d is greater than 20 feet then a site-specific DAF shall be calculated under MO-2 or MO-3. If the distance from the source is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-1;

or (2) a site-specific DAF3 may be calculated under MO-2 or MO-3 (refer to Section H2.5). Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 presented below are not valid and shall not be used. The Submitter may develop a site-specific DAF3 under MO-3;

Distance from POC to POE (feet)	MO-1 Longitudinal DF3 (dimensionless)			
	$S_d \leq 5$ ft	S_d = 6-10 ft	S_d = 11-15 ft	S_d = 16-20 ft
0 - 50	1.5	1	1	1
51 - 100	2.6	1.5	1.2	1.1
101 - 150	4.1	2.1	1.6	1.3
151 - 250	8.4	4.3	3	2.3
251 - 500	29	15	9.8	7.4
501 - 750	63	32	21	16
751 - 1000	111	57	37	28
1001 - 1250	173	86	58	43
1251 - 1500	248	124	83	62
1501 - 1750	337	169	113	84
1751 - 2000	440	220	147	110

(d) If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ in Table 2 is footnoted with a DF3, multiply the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ obtained in Step (b) by the longitudinal DF3 identified in Step (c). If the $Soil_{3DW}$ or $Soil_{3NDW}$ in Table 2 is not footnoted with a DF3, do not multiply the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ by a DF3;

If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ (after multiplying by the DF3) for a COC is less than the $Soil_{GW2}$, then for that COC, the aquifer to be protected shall be managed as an aquifer meeting the definition of Groundwater Classification 2 and the $Soil_{GW2}$ shall be identified as the $Soil_{GW}$ standard. A DF2 (not a DF3) shall be applied to the $Soil_{GW2}$ if the $Soil_{GW2}$ is footnoted with a DF2 in Table 2. If the $Soil_{GW2}$ (after multiplying by the DF2) for a COC is less than the $Soil_{GW1}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ standard. A DF shall not be applied to the $Soil_{GW1}$.

(3) Identify the $Soil_{sat}$ in Table 2. If a COC is not listed in Table 2, then the Submitter shall calculate a $Soil_{sat}$ (if applicable for the COC) using EQ38;

(4) Identify and apply the limiting soil RS as follows:

Surface soil (ground surface to 15 ft bgs):

(a) Compare: (1) the $Soil_{ni}$ or $Soil_i$ identified in Step (1), (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ identified in Step (2), and (3) the $Soil_{sat}$ identified in Step (3); select the lowest of the three values as the limiting RS;

(b) Determine the AOIC for surface soil in accordance with Section 2.8; and

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation is warranted for surface soil.

If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 limiting RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

Subsurface soil (> 15 ft bgs):

(a) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$ identified in Step (2), and (2) the $Soil_{sat}$ identified in Step (3); select the lower of the two values as the limiting soil RS;

(b) Determine the AOIC for subsurface soil in accordance with Section 2.8;

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the subsurface soil is warranted.

If the AOIC is greater than the limiting RS, then the subsurface soil shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 limiting RS.

H1.1.2.2 Evaluation of Soil Using a Leach Test and MO-1 RECAP Standards ($Soil_{ni}$ or $Soil_{i}$ and $Soil_{sat}$)

Surface soil (ground surface to15 ft bgs):

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9. Identify the appropriate risk-based RS ($Soil_{ni}$ for a non-industrial scenario or $Soil_{i}$ for an industrial scenario) in Table 2. If more than one COC identified for MO-1 elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_{i}$ to account for additivity according to the guidelines presented in Appendix G. If a COC is not listed in Table 2, the Submitter shall calculate a $Soil_{ni}$ (EQ1-EQ4) or $Soil_{i}$ (EQ16-EQ19);

(2) Identify the $Soil_{sat}$ in Table 2. If a COC is not listed in Table 2, the Submitter shall calculate a $Soil_{sat}$ using EQ38;

(3) Compare: (1) the $Soil_{ni}$ or $Soil_{i}$ identified in Step (1), and (2) the $Soil_{sat}$ calculated in Step (2); select the lower of the two values as the limiting RS;

(4) Determine the AOIC for surface soil in accordance with Section 2.8;

(5) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for **all** COC, then typically, no further evaluation of the surface soil is warranted for the direct contact exposure pathways or for the protection of resource aesthetics.

If the AOIC is greater than the limiting soil RS, then the surface soil shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 limiting soil RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into two intervals: (1) ground surface to 3 ft bgs; and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

(6) Compare the leach test results (e.g., SPLP) to the appropriate groundwater standard based on the classification of the groundwater to be protected as follows:

For the protection of groundwater meeting the definition of Groundwater Classification 1:

(a) Identify the GW_1 in Table 3. If a COC is not listed in Table 3, the Submitter shall identify/calculate a GW_1 in accordance with Section H2.2.2;

(b) Determine the product of GW_1 x 20 (default value for $DF_{Summers}$);

(c) Compare the leach test results to the product of GW_1 x 20:

If the leach test results are less than or equal to the product of GW_1 x 20, then the soil AOIC is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_1 x 20, then the soil AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required under MO-2 or MO-3 or corrective action is required under MO-1.

For the protection of groundwater meeting the definition of Groundwater Classification 2:

(a) Identify the GW_2 in Table 3. If a COC is not listed in Table 3, the Submitter shall calculate a GW_2 in accordance with Section H2.2.3;

(b) Identify the longitudinal dilution factor (DF2) in the table below based on: (1) the shortest distance between the POC and the nearest downgradient property boundary (POE); and (2) the thickness of the groundwater source (S_d). (The S_d is defined as the thickness of the impacted groundwater within the permeable zone;

refer to Section H2.5, EQ66 and Figure H-1.) If the S_d is greater than 20 feet then a site-specific DAF shall be calculated under MO-2 or MO-3. If the distance from the source is greater than 2000 feet, then: (1) the DF2 for 2000 feet may be used under MO-1; or (2) a site-specific DAF2 may be calculated under MO-2 or MO-3 (refer to Section H2.5). **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented below are not valid and shall not be used. The Submitter may develop a site-specific DAF2 under MO-3;

Distance from POC to POE (feet)	MO-1 Longitudinal DF2 (dimensionless)			
	$S_d \leq 5$ ft	S_d = 6-10 ft	S_d = 11-15 ft	S_d = 16-20 ft
0 - 50	1.5	1	1	1
51 - 100	2.6	1.5	1.2	1.1
101 - 150	4.1	2.1	1.6	1.3
151 - 250	8.4	4.3	3	2.3
251 - 500	29	15	9.8	7.4
501 - 750	63	32	21	16
751 - 1000	111	57	37	28
1001 - 1250	173	86	58	43
1251 - 1500	248	124	83	62
1501 - 1750	337	169	113	84
1751 - 2000	440	220	147	110

(c) Determine the product of GW_2 x 20 (default value for $DF_{Summers}$) x DF2;

(d) Compare the leach test results to the product of GW_2 x 20 x DF2:

If the leach test results are less than or equal to the product of GW_2 x 20 x DF2, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_2 x 20 x DF2, then the AOIC in the soil may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required under MO-2 or MO-3 or corrective action is required under MO-1.

For the protection of groundwater meeting the definition of Groundwater Classification 3:

(a) Identify the GW_{3DW} or GW_{3NDW} in Table 3. If a COC is not listed in Table 3, the Submitter shall calculate a GW_3 in accordance with Section H.2.2.4;

(b) Identify the longitudinal dilution factor (DF3) in the table below based on: (1) the shortest distance between the POC and the nearest downgradient surface water body (POE); and (2) the thickness of the groundwater source (S_d). (The S_d is defined as the thickness of the impacted groundwater within the permeable zone.

Refer to Section H2.5, EQ66 and Figure H-1.). If the S_d is greater than 20 feet then a site-specific DAF3 shall be calculated under MO-2 or MO-3. If the distance from the source is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-1; or (2) a site-specific DAF3 may be calculated under MO-2 or MO-3 (refer to Section H2.5). **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented below are not valid and shall not be used. The Submitter may develop a site-specific DAF3 under MO-3;

Distance from POC to POE (feet)	MO-1 Longitudinal DF3 (dimensionless)			
	$S_d \leq 5$ ft	S_d = 6-10 ft	S_d = 11-15 ft	S_d = 16-20 ft
0 - 50	1.5	1	1	1
51 - 100	2.6	1.5	1.2	1.1
101 - 150	4.1	2.1	1.6	1.3
151 - 250	8.4	4.3	3	2.3
251 - 500	29	15	9.8	7.4
501 - 750	63	32	21	16
751 - 1000	111	57	37	28
1001 - 1250	173	86	58	43
1251 - 1500	248	124	83	62
1501 - 1750	337	169	113	84
1751 - 2000	440	220	147	110

(c) Determine the product of GW_3 x 20 (default value for $DF_{Summers}$) x DF3;

(d) Compare the leach results to the product of GW_3 x 20 x DF3:

If the leach test results are less than or equal to the GW_{3DW} or GW_{3NDW} x 20 x DF3, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the GW_{3DW} or GW_{3NDW} x $DF_{Summers}$ x DF3, then the soil AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required under MO-2 or MO-3 or corrective action is required under MO-1.

Subsurface soil (> 15 ft bgs):

(1) Identify the $Soil_{sat}$ in Table 2. If a COC is not listed in Table 2, the Submitter shall calculate a $Soil_{sat}$ (if applicable for the COC) using EQ38;

(2) Determine the AOIC for subsurface soil in accordance with Section 2.8;

(3) Compare the leach test results to the appropriate groundwater standard based on the classification of the groundwater to be protected as follows:

For the protection of groundwater meeting the definition of Groundwater Classification 1:

(a) Identify the GW_1 in Table 3. If a COC is not listed in Table 3, the Submitter shall calculate a GW_1 in acccordance with Section H2.2.2;

(b) Determine the product of GW_1 x 20 (default value for $DF_{Summers}$);

(c) Compare the leach test results to the product of GW_1 x 20:

If the leach test results are less than or equal to the product of GW_1 x 20, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_1 x $DF_{Summers}$, then the AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required under MO-2 or MO-3 or corrective action is required under MO-1.

For the protection of groundwater meeting the definition of Groundwater Classification 2:

(a) Identify the GW_2 in Table 3. If a COC is not listed in Table 3, the Submitter shall calculate a GW_2 in accordance with Section H2.2.3;

(b) Identify the longitudinal dilution factor (DF2) from the table based on: (1) the shortest distance between the POC and the nearest downgradient property boundary (POE); and (2) the thickness of the groundwater source (S_d). (The S_d is defined as the thickness of the impacted groundwater within the permeable zone; refer to Section H2.5, EQ66 and Figure H-1.) If the S_d is greater than 20 feet then a site-specific DAF2 shall be calculated under MO-2 or MO-3. If the distance from the source is greater than 2000 feet, then: (1) the DF2 for 2000 feet may be used under MO-1; or (2) a site-specific DAF2 may be calculated under MO-2 or MO-3 (refer to Section H2.5). **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented below are not valid and shall not be used. The Submitter may develop a site-specific DAF2 under MO-3;

Distance from POC to POE (feet)	MO-1 Longitudinal DF2 (dimensionless)			
	$S_d \leq 5$ ft	S_d = 6-10 ft	S_d = 11-15 ft	S_d = 16-20 ft
0 - 50	1.5	1	1	1
51 - 100	2.6	1.5	1.2	1.1
101 - 150	4.1	2.1	1.6	1.3
151 - 250	8.4	4.3	3	2.3
251 - 500	29	15	9.8	7.4
501 - 750	63	32	21	16
751 - 1000	111	57	37	28
1001 - 1250	173	86	58	43
1251 - 1500	248	124	83	62
1501 - 1750	337	169	113	84
1751 - 2000	440	220	147	110

(c) Determine the product of GW_2 x 20 (default value for $DF_{Summers}$) x DF2;

(d) Compare the leach test results to the product of GW_2 x 20 x DF2:

If the leach test results are less than or equal to the product of GW_2 x 20 x DF2, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_2 x 20 x DF2, then the soil AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required under MO-2 or MO-3 or corrective action is required under MO-1.

For the protection of groundwater meeting the definition of Groundwater Classification 3:

(a) Identify the GW_{3DW} or GW_{3NDW} in Table 3. If a COC is not listed in Table 3, the Submitter shall calculate a GW_3 in accordance with Section H2.2.4;

(b) Identify the longitudinal dilution factor (DF3) from the table below based on: (1) the shortest distance between the POC and the nearest downgradient surface water body (POE); and (2) the thickness of the groundwater source (S_d). (The S_d is defined as the thickness of the impacted groundwater within the permeable zone; refer to Section H2.5, EQ66 and Figure H-1.) If the S_d is greater than 20 feet then a site-specific DAF3 shall be calculated under MO-2 or MO-3. If the distance from the source is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-1; or (2) a site-specific DAF3 may be calculated under MO-2 or MO-3 (refer to Section H2.5). **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented below are not valid and shall not be used. The Submitter may develop a site-specific DAF3 under MO-3;

Distance from POC to POE (feet)	MO-1 Longitudinal DF3 (dimensionless)			
	$S_d \leq 5$ ft	$S_d = 6\text{-}10$ ft	$S_d = 11\text{-}15$ ft	$S_d = 16\text{-}20$ ft
0 - 50	1.5	1	1	1
51 - 100	2.6	1.5	1.2	1.1
101 - 150	4.1	2.1	1.6	1.3
151 - 250	8.4	4.3	3	2.3
251 - 500	29	15	9.8	7.4
501 - 750	63	32	21	16
751 - 1000	111	57	37	28
1001 - 1250	173	86	58	43
1251 - 1500	248	124	83	62
1501 - 1750	337	169	113	84
1751 - 2000	440	220	147	110

(c) Determine the product of GW_3 x 20 (default value for $DF_{Summers}$) x DF3;

(d) Compare the leach test results to the product of GW_3 x 20 x DF3:

If the leach test results are less than or equal to the GW_{3DW} or GW_{3NDW} x 20 x DF3, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the GW_{3DW} or GW_{3NDW} x 20 x DF3, then the soil AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required under MO-2 or MO-3 or corrective action is required under MO-1.

(4) Compare the AOIC to the $Soil_{sat}$:

If the AOIC is less than or equal to the $Soil_{sat}$ for all COC, then typically, no further evaluation of the subsurface soil is warranted for the protection of resource aesthetics.

If the AOIC is greater than the $Soil_{sat}$, then the subsurface soil shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 $Soil_{sat}$.

If a limiting MO-1 soil RS developed by a Submitter is below the analytical quantitation limit, then the analytical quantitation limit shall be identified as the limiting soil RS. The analytical quantitation limit identified for application as a RS shall be the lowest quantitation limit available by routine analysis and shall be approved by the Department prior to use. A MO-1 Soil RS based on the analytical quantitation limit shall not be multiplied by a DF.

If the limiting MO-1 soil RS is below a Department-approved (refer to Section 2.13) background concentration, the background concentration shall be identified as the limiting soil RS. A MO-1 soil RS based on an approved background concentration shall not be multiplied by a DF.

A MO-1 $Soil_{GW}$ shall not result in an unacceptable constituent concentration (greater than GW_1 or GW_2) in deeper groundwater zones meeting the definition of Groundwater Classifications 1 or 2.

If the Department determines that impacted soil is a source medium only (exposure to impacted soil is not likely based on current or future land use and site-specific conditions), then it shall not be required that the risk-based standard for soil ($Soil_{ni}$ or $Soil_i$) be considered in the identification of the limiting RS.

Application of MO-1 soil RS shall not result in soil that exhibits hazardous waste characteristics of ignitability, corrosivity or reactivity as defined in the Hazardous Waste Regulations (LAC 33:V).

In applying the MO-1 limiting RS for the TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in soil shall not exceed 10,000 mg/kg (i.e., the sum of the residual concentrations for the TPH fractions and mixtures shall not exceed 10,000 mg/kg). Refer to Appendix D (Page D-3) for further guidance on addressing petroleum hydrocarbon releases.

Refer to Section 4.0 of the main document for further guidance on the implementation of MO-1.

For the generation of Table 2, the analytical quantitation limit was presented in Table 2 as the RS if the $Soil_{ni}$, $Soil_i$, $Soil_{GW1}$, $Soil_{GW2}$ (after multiplying by the DF2), $Soil_{GW3DW}$ (after multiplying by the DF3), $Soil_{GW3NDW}$ (after multiplying by the DF3), or $Soil_{sat}$ developed under MO-1 was below the analytical quantitation limit. The toxicity and chemical-specific values used to calculate the MO-1 RS are presented in Tables H-1 and H-2. The hierarchies of references used to obtain the toxicity and chemical-specific parameters are presented in Table H-3. The SQL values used in Table 2 are presented in Table H-4. The worksheets for the development of the MO-1 RS are presented at the end of this Appendix. The procedures used in the development of the soil MO-1 RECAP standards are illustrated in Figures 10 and 13 of the main document.

H1.1.3 Management Option 2

The MO-2 soil RS include $Soil_{ni}$, $Soil_i$, $Soil_{ni}$-PEF, $Soil_i$-PEF, $Soil_{es}$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, and $Soil_{sat}$ (refer to Section 2.12). Based on the conceptual site model, the Submitter shall calculate all applicable soil RS in accordance with Section H2.1. The MO-2 RS and AOIC shall be calculated using: 1) the spreadsheets located on LDEQ's website at http://www.deq.state.la.us/technology/recap/; or 2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. Site-specific environmental fate and transport data may be used as specified in Section H2.1. Site-specific exposure data shall **not** be used in the development of MO-2 RS; standard exposure parameters representative of a reasonable maximum exposure scenario shall be used as presented in Section H2.1. If available, the chemical-specific data presented in the worksheets at the end of this appendix shall be used in the calculation of the MO-2 RS. MO-2 RECAP Standards shall only be developed for the exposure pathways, exposure scenarios, and land uses defined in Section 2.12. Environmental fate and transport models other than those presented in this Appendix shall **not** be used in the MO-2 assessment. For a non-detect result, the SQL shall be compared to the limiting MO-2 RS to document that the SQL is less than or equal to the limiting RS prior to eliminating the constituent from further evaluation under the RECAP.

For the evaluation of soil using $Soil_{ni}$ or $Soil_i$, $Soil_{GW}$, and $Soil_{sat}$, follow the guidelines in Section H1.1.3.1.

For the evaluation of soil using a leach test instead of the $Soil_{GW}$, follow the guidelines in Section 1.1.3.2.

For the evaluation of soil with high fugitive dust emissions (Soil-PEF), follow the guidelines in Section 1.1.3.3.

For the evaluation of soil impacted with volatile constituents located beneath an enclosed structure ($Soil_{es}$), follow the guidelines in Section 1.1.3.4.

H1.1.3.1 Evaluation of Soil using MO-2 RECAP Standards ($Soil_{ni}$ or $Soil_i$, $Soil_{GW}$, and $Soil_{sat}$)

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use at the AOI in accordance with the guidelines presented in Section 2.9. Calculate the appropriate risk-based soil RECAP Standard for the direct exposure pathways ($Soil_{ni}$ for a non-industrial scenario or $Soil_i$ for an industrial scenario) using EQ1-EQ4 or EQ16-EQ19. If more than one COC identified for MO-2 elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G. **Note:** If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 $Soil_i$ or $Soil_{ni}$ presented in Table 2.

(2) Calculate a site-specific soil concentration protective of groundwater standard ($Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) based on the classification of the groundwater to be protected (refer to Section 2.10 for the groundwater classifications) using one of the 4 methods presented in Section H2.1.4.3. If the $Soil_{GW3}$ (after applying the DAF3) for a COC is less than the $Soil_{GW2}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 2 aquifer and the $Soil_{GW2}$ shall be identified as the $Soil_{GW}$ RS. **Note:** A DAF2 (not a DAF3) shall be applied to the $Soil_{GW2}$. If the $Soil_{GW2}$ (after applying the DAF2) for a COC is less than the $Soil_{GW1}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ RS. A DAF shall not be applied to the $Soil_{GW1}$ RS. **Note:** If the area of impacted soil is less than or equal to

0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 or DF3 (refer to Section H1.1.2.1).

(3) If applicable for the COC, calculate a site-specific $Soil_{sat}$ using EQ38;

(4) Identify and apply the limiting soil RS as follows:

Surface soil (ground surface to 15 ft bgs):

(a) Compare: (1) the $Soil_{ni}$ or $Soil_i$ calculated in Step (1), (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (2), and (3) the $Soil_{sat}$ calculated in Step (3); select the lowest of the three values as the limiting RS;

(b) Determine the AOIC for surface soil in accordance with Section 2.8; and

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COCs, then typically, no further evaluation is warranted for surface soil.

If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs; and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

Subsurface soil (> 15 ft bgs):

(a) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (2), and (2) the $Soil_{sat}$ calculated in Step (3); select the lower of the two values as the limiting soil RS;

(b) Determine the AOIC for subsurface soil in accordance with Section 2.8;

(c) Compare the AOIC with the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the subsurface soil is warranted.

If the AOIC is greater than the limiting RS, then the subsurface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

H1.1.3.2 Evaluation of Soil using a Leach Test and MO-2 RECAP Standards ($Soil_i$ or $Soil_{ni}$ and $Soil_{sat}$)

Surface soil (ground surface to 15 ft bgs):

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9 and calculate a risk-based soil RECAP Standard for the direct exposure pathways ($Soil_{ni}$ for a non-industrial scenario or $Soil_i$ for an industrial scenario) using EQ1-EQ4 or EQ16-EQ19. If more than one COC identified for MO-2 elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G. **Note:** If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 $Soil_i$ or $Soil_{ni}$ presented in Table 2.

(2) Calculate a site-specific $Soil_{sat}$ (if applicable for the COC) using EQ38;

(3) Compare: (1) the $Soil_{ni}$ or $Soil_i$ calculated in Step (1) and (2) the $Soil_{sat}$ calculated in Step (2); select the lower of the two values as the limiting RS;

(4) Determine the AOIC for surface soil in accordance with Section 2.8;

(5) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the surface soil is warranted for the protection of human health for direct exposure or for the protection of resource aesthetics.

If the AOIC is greater than the limiting soil RS, then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting soil RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs; and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

(6) Compare the leach test results (e.g., SPLP) to the appropriate standard based on the classification of the groundwater to be protected as follows:

For the protection of groundwater meeting the definition of Groundwater Classification 1:

(a) Identify the GW_1 in Table 3. If a COC is not listed in Table 3, the Submitter shall identify/calculate a GW_1 in accordance with Section H2.2.2;

(b) Calculate a site-specific $DF_{Summers}$ using EQ61 (refer to Section H2.4) (the default value of 20 may be used for the $DF_{Summers}$);

(c) Determine the product of GW_1 x $DF_{Summers}$;

(d) Compare the leach test results to the product of GW_1 x $DF_{Summers}$:

If the leach test results are less than or equal to the product of GW_1 x $DF_{Summers}$, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_1 x $DF_{Summers}$, then the COC source concentration in the soil may not be protective of groundwater and further evaluation of the soil to groundwater pathway is required under MO-3 or corrective action is required under MO-2.

For the protection of groundwater meeting the definition of Groundwater Classification 2:

(a) Identify the GW_2 in Table 3. If a COC is not listed in Table 3, the Submitter shall calculate a GW_2 in accordance with Section H2.2.3;

(b) Calculate a site-specific $DF_{Summers}$ (EQ61) (the default value of 20 may be used for the $DF_{Summers}$) and a site-specific DAF2 (EQ65) in accordance with Sections H2.4 and H2.5. **Note:** If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 (refer to Section H1.1.2.1);

(c) Determine the product of GW_2 x $DF_{Summers}$ x DAF2;

(d) Compare the leach test results to the product of GW_2 x $DF_{Summers}$ x DAF2:

If the leach test results are less than or equal to the product of GW_2 x $DF_{Summers}$ x DAF2, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_2 x $DF_{Summers}$ x DAF2, then the AOIC in the soil may not be protective of groundwater and further evaluation of the soil to groundwater pathway is required under MO-3 or corrective action is required under MO-2.

For the protection of groundwater meeting the definition of Groundwater Classification 3:

(a) Identify the GW_{3DW} or GW_{3NDW} in Table 3. If a COC is not listed in Table 3, the Submitter shall calculate a GW_3 in accordance with Section H2.2.4;

(b) Calculate a site-specific $DF_{Summers}$ (EQ61) and a site-specific DAF3 (EQ65) in accordance with Sections H2.4 and H2.5. **Note:** If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF3 (refer to Section H1.1.2.1);

(c) Determine the product of GW_3 x $DF_{Summers}$ x DAF3;

(d) Compare the leach test results to the product of GW_3 x $DF_{Summers}$ x DAF3:

If the leach test results are less than or equal to the product of GW_{3DW} or GW_{3NDW} x $DF_{Summers}$ x DAF3, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_{3DW} or GW_{3NDW} x $DF_{Summers}$ x DAF3, then the AOIC in the soil may not be protective of groundwater and further evaluation of the soil to groundwater pathway is required under MO-3 or corrective action is required under MO-2.

Subsurface soil (> 15 ft bgs):

(1) Compare the leach test results to the appropriate standard based on the classification of the groundwater to be protected as follows:

For the protection of groundwater meeting the definition of Groundwater Classification 1:

(a) Identify the GW_1 in Table 3. If a COC is not listed in Table 3, the Submitter shall identify a GW_1 in accordance with Section H2.2.2;

(b) Calculate a site-specific $DF_{Summers}$ using EQ61 (refer to Section H2.4) (the default value of 20 may be used for the $DF_{Summers}$);

(c) Multiply the GW_1 by the $DF_{Summers}$;

(d) Compare the leach test results to the product of GW_1 x $DF_{Summers}$:

If the leach test results are less than or equal to the GW_1 x $DF_{Summers}$, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the GW_1 x $DF_{Summers}$, then the COC source concentration in the soil may not be protective of groundwater and further evaluation of the soil to groundwater pathway is required under MO-3 or corrective action is required under MO-2.

For the protection of groundwater meeting the definition of Groundwater Classification 2:

(a) Identify the GW_2 in Table 3. If a COC is not listed in Table 3, the Submitter shall identify a GW_2 in accordance with Section H2.2.3;

(b) Calculate a site-specific $DF_{Summers}$ (EQ61; refer to Section H2.4) (the default value of 20 may be used for the $DF_{Summers}$) and a site-specific DAF2 (EQ65; refer to Section H2.5). **Note:** If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 (refer to Section H1.1.2.1);

(c) Determine the product of GW_2 x $DF_{Summers}$ x DAF2;

(d) Compare the leach test results to the GW_2 x $DF_{Summers}$ x DAF2:

If the leach test results are less than or equal to the product of GW_2 x $DF_{Summers}$ x DAF2, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_2 x $DF_{Summers}$ x DAF2, then the AOIC in the soil may not be protective of groundwater and further evaluation of the soil to groundwater pathway is required under MO-3 or corrective action is required under MO-2.

For the protection of groundwater meeting the definition of Groundwater Classification 3:

(a) Identify the GW_{3DW} or GW_{3NDW} in Table 3. If a COC is not listed in Table 3, the Submitter shall calculate a GW_3 in accordance with Section H2.2.4;

(b) Calculate a site-specific $DF_{Summers}$ (EQ61; refer to Section H2.4) the default value of 20 may be used for the $DF_{Summers}$) and a site-specific DAF3 (EQ65; refer to Section H2.5). **Note:** If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF3 (refer to Section H1.1.2.1);

(c) Determine the product of GW_3 x $DF_{Summers}$ x DAF3;

(d) Compare the leach test results to product of GW_3 x $DF_{Summers}$ x DAF3:

If the leach test results are less than or equal to the product of GW_{3DW} or GW_{3NDW} x $DF_{Summers}$ x DAF3, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_{3DW} or GW_{3NDW} x $DF_{Summers}$ x DAF3, then the AOIC in the soil may not be protective of groundwater and further evaluation of the soil to groundwater pathway is required under MO-3 or corrective action is required under MO-2.

(2) Calculate a site-specific $Soil_{sat}$ (if applicable to the COC) using EQ38;

(3) Determine the AOIC for subsurface soil in accordance with Section 2.8;

(4) Compare the AOIC to the $Soil_{sat}$:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the soil is warranted for the protection of resource aesthetics.

If the AOIC is greater than the limiting soil RS, then the soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting soil RS.

H1.1.3.3 Evaluation of Surface Soil Associated with High Fugitive Dust Emissions (Soil-PEF, $Soil_{GW}$, and $Soil_{sat}$)

If high fugitive dust emissions are a concern throughout the AOI:

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9 and calculate the appropriate risk-based soil RECAP Standard that includes the inhalation of dust emissions pathway ($Soil_{ni}$-PEF for a non-industrial scenario or $Soil_i$-PEF for an industrial scenario) using EQ5, EQ6, EQ7, EQ8, EQ21, EQ22, EQ23, or EQ24. If more than one COC identifed for MO-2 elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$-PEF or $Soil_i$-PEF to account for additivity according to the guidelines presented in Appendix G. **Note:** If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 $Soil_i$ or $Soil_{ni}$ presented in Table 2.

(2) Calculate a site-specific soil concentration protective of groundwater standard ($Soil_{GW1,}$ $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ depending on the classification of the groundwater to be protected - refer to Section 2.10 for the groundwater classifications) using one of the $Soil_{GW}$ Methods presented in Section H2.1.4.3. If the $Soil_{GW3}$ (after applying the DAF3) for a COC is less than the $Soil_{GW2}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 2 aquifer and the $Soil_{GW2}$ shall be identified as the $Soil_{GW}$ RS. A DAF2 (not a DAF3) shall be applied to the $Soil_{GW2}$. If the $Soil_{GW2}$ (after applying the DAF2) for a COC is less than the $Soil_{GW1}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ RS. A DAF shall not be applied to the $Soil_{GW1.}$

Note: If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 or DF3 (refer to Section H1.1.2.1).

Note: In lieu of applying a $Soil_{GW}$ RS at the AOI, the soil to groundwater pathway may be evaluated using a leach test (refer to Section H1.1.3.2 and Section H2.1.4.3, $Soil_{GW}$ Method 3);

(3) Calculate a site-specific $Soil_{sat}$ (if applicable to the COC) using EQ38;

(4) Identify and apply the limiting RS as follows:

(a) Compare: (1) the $Soil_{ni}$-PEF or $Soil_{i}$-PEF calculated in Step (1), (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (2), and (3) the $Soil_{sat}$ calculated in Step (3); select the lowest of the three values as the limiting RS;

(b) Determine the AOIC for surface soil in accordance with Section 2.8;

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COCs, then typically, no further evaluation is warranted for surface soil.

If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

If high fugitivie dust emissions are a concern for only a portion of the AOI:

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use at the AOI in accordance with the guidelines presented in Section 2.9. Calculate the appropriate risk-based soil RECAP Standard for the direct contact exposure pathways ($Soil_{ni}$ for a non-industrial scenario or $Soil_{i}$ for an industrial scenario) using EQ1-EQ4 or EQ16-EQ19. If more than one constituent is present in soil that elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_{i}$ to account for additivity according to the guidelines presented in Appendix G;

(2) Calculate a site-specific soil concentration protective of groundwater standard ($Soil_{GW1,}$ $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) depending on the classification of the groundwater to be protected (refer to Section 2.10 for the groundwater classifications) using one of the methods in Section H2.1.4.3. If the $Soil_{GW3}$ (after applying the DAF3) for a COC is less than the $Soil_{GW2}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 2 aquifer and the $Soil_{GW2}$ shall be

identified as the $Soil_{GW}$ RS. A DAF2 (not a DAF3) shall be applied to the $Soil_{GW2}$. If the $Soil_{GW2}$ (after applying the DAF2) for a COC is less than the $Soil_{GW1}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ RS. A DAF shall not be applied to the $Soil_{GW1}$ RS.

Note: If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 or DF3 (refer to Section H1.1.2.1).

Note: In lieu of applying a $Soil_{GW}$ RS at the AOI, the soil to groundwater pathway may be evaluated using a leach test (refer to Section H1.1.3.2 and Section H2.1.4.3, $Soil_{GW}$ Method 3);

(3) If applicable for the COC, calculate a site-specific $Soil_{sat}$ using EQ38;

(4) Identify and apply the limiting soil RS to **all** of the current/potenital surface soil within the boundaries of the AOI as follows:

(a) Compare: (1) the $Soil_{ni}$ or $Soil_i$ calculated in Step (1), (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (2), and (3) the $Soil_{sat}$ calculated in Step (3); select the lowest of the three values as the limiting RS;

(b) Determine the AOIC for surface soil in accordance with Section 2.8; and

(c) Compare the AOIC for surface soil to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COCs, then typically, no further evaluation is warranted for surface soil (ingestion, dermal contact, and inhalation of volatile emissions).

If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

(5) Calculate the appropriate risk-based RECAP Standard that includes the inhalation of dust emissions pathway [$Soil_{ni}$-PEF for a non-industrial scenario (EQ5, EQ6, EQ7, or EQ8) or $Soil_i$-PEF for an industrial scenario (EQ21, EQ22, EQ23, or EQ24)]. If more than one constituent is present that elicits noncarcinogenic effects on the same target organ/system, modify the Soil-PEF to account for additivity according to the guidelines presented in Appendix G;

(6) Determine the AOIC for the portion of the AOI that is associated with high fugitive dust emissions;

(7) Compare the AOIC that is associated with high fugitive dust emissions to the Soil-PEF:

If the AOIC is less than or equal to the Soil-PEF, then typically, no further evaluation is warranted for this pathway.

If the AOIC is greater than the Soil-PEF, then the soil associated with high fugitive dust emissions shall be further evaluated under MO-3 or remediated to the MO-2 Soil-PEF.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

H1.1.3.4 Evaluaton of Soil Impacted with Volatile Constituents Located Beneath an Enclosed Structure ($Soil_{es}$, $Soil_{ni}$ or $Soil_i$, $Soil_{GW}$, and $Soil_{sat}$)

If the volatile emissions from soil to an enclosed structure pathway is a concern throughout the AOI:

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9 and calculate a risk-based soil RECAP Standard for direct contact pathways ($Soil_{ni}$ for a non-industrial scenario or $Soil_i$ for an industrial scenario) using EQ1-EQ4 and EQ16-EQ19. If more than one COC identified for the soil to an enclosed structure pathway elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G;

(2) Calculate the risk-based RECAP Standard for the inhalation of volatile emissions from soil to an enclosed structure pathway ($Soil_{es}$ for a non-industrial or an industrial scenario) using EQ26. If more than one constituent is present in soil that elicits noncarcinogenic effects on the same target organ/system or both soil and groundwater are contributing volatile emissions to the enclosed structure, modify the $Soil_{es}$ (C_a) to account for additivity according to the guidelines presented in Appendix G.

Note: In lieu of applying a $Soil_{es}$ RECAP Standard at the AOI, soil gas sampling or indoor air sampling may be conducted at the AOI (for further guidance on the evaluation of COC concentrations in indoor air refer to Section B2.5.15 of Appendix B and Sections H1.1.3.5 and H2.3 of this Appendix);

(3) Calculate a site-specific soil concentration protective of groundwater standard ($Soil_{GW1,}$ $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$ depending on the classification of the groundwater to be protected - refer to Section 2.10 for the groundwater classifications) in accordance with Section H2.1.4.3. If the $Soil_{GW3}$ (after applying the DAF3) for a COC is less than the $Soil_{GW2}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 2 aquifer and the $Soil_{GW2}$ shall be identified as the $Soil_{GW}$ RS. A DAF2 (not a DAF3) shall be applied to the $Soil_{GW2}$. If the $Soil_{GW2}$ (after applying the DAF2) for a COC is less than the $Soil_{GW1}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ RS. A DAF shall not be applied to the $Soil_{GW1}$.

Note: If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 or DF3 (refer to Section H1.1.2.1).

Note: In lieu of applying a $Soil_{GW}$ RS at the AOI, the soil to groundwater pathway may be evaluated using a leach test (refer to Section H1.1.3.2 and Section H2.1.4.3, $Soil_{GW}$ Method 3).

(4) Calculate a site-specific $Soil_{sat}$ (if applicable for the COC) using EQ38;

(5) Identify and apply the limiting RS to as follows:

For a non-permanent enclosed structure:

Surface soil (ground surface to 15 ft bgs):

(a) Compare: (1) the $Soil_{ni}$ or $Soil_{i}$ calculated in Step (1), (2) the $Soil_{es}$ calculated in Step (2), (3) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (3), and (4) the $Soil_{sat}$ identified in Step (4); select the lowest of the four values as the limiting RS;

(b) Determine the AOIC for surface soil in accordance with Section 2.8; and

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COCs, then typically, no further evaluation is warranted for surface soil.

If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

Subsurface soil (> 15 ft bgs):

(a) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (3) and (2) the $Soil_{sat}$ calculated in Step (4); select the lower of the two values as the limiting soil RS;

(b) Determine the AOIC for subsurface soil in accordance with Section 2.8;

(c) Compare the AOIC with the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the subsurface soil is warranted.

If the AOIC is greater than the limiting RS, then the subsurface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

For a permanent enclosed structure:

Surface soil (ground surface to 15 ft bgs):

(a) Compare: (1) the $Soil_{es}$ calculated in Step (2), (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (3), and (3) the $Soil_{sat}$ identified in Step (4); select the lowest of the three values as the limiting RS;

(b) Determine the AOIC for surface soil in accordance with Section 2.8; and

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COCs, then typically, no further evaluation is warranted for surface soil.

If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

Subsurface soil (> 15 ft bgs):

(a) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (3) and (2) the $Soil_{sat}$ calculated in Step (4); select the lower of the two values as the limiting soil RS;

(b) Determine the AOIC for subsurface soil in accordance with Section 2.8;

(c) Compare the AOIC with the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the subsurface soil is warranted.

If the AOIC is greater than the limiting RS, then the subsurface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

If the volatile emissions from soil to an enclosed structure pathway is a concern for only a portion of the AOI:

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use at the AOI in accordance with the guidelines presented in Section 2.9. Calculate the risk-based soil RECAP Standard for the direct exposure pathways ($Soil_{ni}$ for a non-industrial scenario or $Soil_i$ for an industrial scenario) using EQ1-EQ4 or EQ16-EQ19. If more than one COC identified for the soil to an enclosed structure pathway elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G;

(2) Calculate a site-specific soil concentration protective of groundwater standard ($Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) depending on the classification of the groundwater to be protected (refer to Section 2.10 for the groundwater classifications) in accordance with Section H2.1.4.3 of this Appendix. If the $Soil_{GW3}$ (after applying the DAF3) for a COC is less than the $Soil_{GW2}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 2 aquifer and the $Soil_{GW2}$ shall be identified as the $Soil_{GW}$ RS. A DAF2 (not a DAF3) shall be applied to the $Soil_{GW2}$. If the $Soil_{GW2}$ (after applying the DAF2) for a COC is less than the $Soil_{GW1}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ RS. A DAF shall not be applied to the $Soil_{GW1}$ RS.

Note: If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 or DF3 (refer to Section H1.1.2.1).

Note: In lieu of applying a $Soil_{GW}$ RS at the AOI, the soil to groundwater pathway may be evaluated using a leach test (refer to Section H1.1.3.2 and Section H2.1.4.3, $Soil_{GW}$ Method 3);

(3) If applicable for the COC, calculate a site-specific $Soil_{sat}$ using EQ38;

(4) Identify and apply the limiting soil as follows:

Surface soil (ground surface to 15 ft bgs):

(a) Compare: (1) the $Soil_{ni}$ or $Soil_i$ calculated in Step (1), (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (2), and (3) the $Soil_{sat}$ calculated in Step (3); select the lowest of the three values as the limiting RS;

(b) Determine the AOIC for **all** surface soil within the boundaries of the AOI in accordance with Section 2.8; and

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation (i.e., ingestion of soil, inhalation of volatiles from soil, dermal contact with soil, soil to groundwater cross-media transfer, and protection of resource aesthetics) is warranted for surface soil.

If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

Subsurface soil (> 15 ft bgs):

(a) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (2), and (2) the $Soil_{sat}$ calculated in Step (3); select the lower of the two values as the limiting soil RS;

(b) Determine the AOIC for all subsurface soil within the AOI in accordance with Section 2.8;

(c) Compare the AOIC with the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation (soil to groundwater cross-media transfer and protection of resource aesthetics) of the subsurface soil is warranted.

If the AOIC is greater than the limiting RS, then the subsurface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

(5) Calculate the risk-based RECAP Standard for the inhalation of volatile emissions from soil to an enclosed structure ($Soil_{es}$) for the appropriate land use scenario (non-industrial or industrial) using EQ26. If more than one constituent is present that elicits noncarcinogenic effects on the same target organ/system or both soil and groundwater are contributing volatile emissions to the enclosed structure, modify the $Soil_{es}$ (C_a) to account for additivity according to the guidelines presented in Appendix G. **Note:** In lieu of applying a $Soil_{es}$ RECAP Standard at the AOI, soil gas sampling or indoor air sampling may be conducted at the AOI (for guidance on evaluating COC concentrations in indoor air refer to Section B2.5.12 of Appendix B and Sections H1.1.3.5 and H2.3 of this Appendix).

(6) Determine the AOIC for the area of soil within the AOI that is associated with volatile emissions to the enclosed structure;

(7) Compare the AOIC for the portion of the AOI that is associated with volatile emissions to the enclosed structure to the $Soil_{es}$:

If the AOIC is less than or equal to the $Soil_{es}$, then typically, no further evaluation is warranted for this pathway.

If the AOIC is greater than the $Soil_{es}$, then the soil associated with volatile emissions to an enclosed structure shall be further evaluated under MO-3 or remediated to the MO-2 $Soil_{es}$.

H1.1.3.5 Evaluation of Soil Impacted with Volatile Constituents Located Beneath an Enclosed Structure Using Indoor Air Sampling

For a non-permanent enclosed structure:

(1) Evaluate the soil AOI in accordance with Section H1.1.3.1;

(2) Determine the indoor air concentration at the AOI in accordance with the guidelines in Appendix B;

(3) Identify the C_a in accordance with Section H2.3:

If the indoor air concentration is less than or equal to the C_a for all COCs, then typically, no further evaluation is warranted for the volatile emissions from soil to an enclosed structure pathway for surface soil.

If the indoor air concentration is greater than the C_a then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting $Soil_{es}$.

For a permanent enclosed structure:

Surface soil:

(1) Determine the indoor air concentration at the AOI in accordance with the guidelines in Appendix B;

(2) Identify the C_a in accordance with Section H2.3:

If the indoor air concentration is less than or equal to the C_a for all COCs, then typically, no further evaluation is warranted for the volatile emissions from soil to an enclosed structure pathway for surface soil.

If the indoor air concentration is greater than the C_a then the surface soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting $Soil_{es}$ (EQ26).

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into two intervals: (1) ground surface to 3 ft bgs and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

Soil from ground surface to depth of impact:

(1) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ and (2) the $Soil_{sat}$; select the lower of the two values as the limiting RS;

(2) Determine the AOIC for soil in accordance with Section 2.8; and

(3) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the soil to groundwater pathway or soil aesthetics is warranted.

If the AOIC is greater than the limiting RS, then the soil shall be further evaluated under MO-3 or remediated to the MO-2 limiting RS.

If the MO-2 limiting soil RECAP Standard is below the background concentration (as approved by the Department, refer to Section 2.13), the background concentration shall be identified as the limiting soil RS.

If the MO-2 limiting soil RECAP Standard is below the Department-approved analytical quantitation limit, then the analytical quantitation limit shall be identified as the limiting soil RS. The lowest analytical quantitation limit identified for application as the MO-2 RS shall be the lowest analytical quantitation limit available by routine analysis and shall be approved by the Department. A limiting soil RS based on an analytical quantitation limit or a background concentration shall not be multiplied by a DAF.

A MO-2 $Soil_{GW}$ shall not result in an unacceptable (greater than GW_1 or GW_2) constituent concentration in deeper groundwater zones meeting the definition of Groundwater Classifications 1 or 2.

Application of MO-2 soil RS shall not result in soil that exhibits hazardous waste characteristics of ignitability, corrosivity, or reactivity as defined in the Hazardous Waste Regulations (LAC 33:V).

In identifying the MO-2 limiting RS for TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in soil shall not exceed 10,000 mg/kg (i.e., the sum of the residual concentration for the TPH fractions and mixtures shall not exceed 10,000 mg/kg). Refer to Appendix D for further guidance on addressing petroleum hydrocarbon releases.

If the Department determines that impacted soil is a source medium only (exposure to impacted soil is not likely based on current or future land use and site-specific conditions), then it shall not be required that the risk-based standard for soil ($Soil_{ni}$ or $Soil_i$) be considered in the identification of the limiting RS.

Refer to Section 5.0 of the main document for further guidance on the implementation of MO-2.

H1.1.4 Management Option 3

The MO-3 soil RS shall include $Soil_{ni}$, $Soil_i$, $Soil_{ni}$-PEF, $Soil_i$-PEF, $Soil_{es}$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, and $Soil_{sat}$ (EQ1-EQ8, EQ16-EQ19, EQ21-EQ24, and EQ38) (refer to Section 2.12 for the RS definitions). Based on the conceptual site model, the Submitter shall calculate **all** applicable soil RS in accordance with Section H2.1. MO-3 soil RECAP Standards shall be developed for **all** exposure pathways, exposure scenarios, and land uses identified to be applicable at the AOI. The applicable soil RS shall be compared and the lowest RS shall be identified as the limiting soil RS. Site-specific environmental fate and transport data and site-specific exposure data may be used in the development of the MO-3 RS. If available, the chemical-specific data presented in the worksheets at the end of this Appendix shall be used in the calculation of the MO-3 RS.

Evaluation of Soil using MO-3 RECAP Standards:

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use at the AOI in accordance with the guidelines presented in Section 2.9. Calculate risk-based RS to address the exposure pathways identifed for the soil in the CSM [e.g., $Soil_{ni}$ (EQ1-EQ4), $Soil_i$ (EQ16-EQ19), $Soil_{ni}$-PEF (EQ5-EQ8), $Soil_i$-PEF (EQ21-EQ24)]. Site-specific exposure parameters shall be representative of a reasonable maximum exposure scenario and are subject to approval by the Department. In the absence of site-specific data, the default values presented in Section H2.1 shall be used unless otherwise approved by the Department. If more than one COC identified for MO-3 elicits the same noncarcinogenic critical effect (or affects the same target organ/system), then the risk-based RS shall be adjusted to account for potential additive health effects associated with simultaneous exposure to multiple noncarcinogens in accordance with the guidelines in Section 2.14. If a receptor may be exposed to more than one impacted medium, then the risk-based RS shall be adjusted to account for potential additive effects associated with simultaneous exposure to more than one medium.

For the release of volatile emissions from soil to an enclosed structure pathway, a $Soil_{es}$ (EQ26) RS shall be calculated. If more than one COC identified for MO-3 elicits the same noncarcinogenic critical effect (or affects the same target organ/system), then the C_a shall be adjusted to account for potential additive health effects associated with simultaneous exposure to multiple noncarcinogens in accordance with the guidelines in Section 2.14. If volatile emissions are orginating from both soil and groundwater, then the C_a shall be adjusted to account for additivity associated with two sources of exposure. Note: In lieu of applying a MO-3 $Soil_{es}$ RS at the AOI, soil gas sampling or indoor air sampling may be conducted (for guidance on evaluating indoor air COC concentrations refer to Section B2.5.12 of Appendix B and Section H2.3 of this Appendix).

(2) Calculate a site-specific soil concentration protective of groundwater standard ($Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) based on the classification of the groundwater to be protected (refer to Section 2.10 for the groundwater classifications). An appropriate and protective estimate of COC attenuation associated with mixing in the groundwater zone and longitudinal migration from the soil AOI to the nearest downgradient property boundary may be used in the calculation of the $Soil_{GW2}$ RS. An appropriate and protective estimate of COC attenuation associated with mixing in the groundwater zone and longitudinal migration from the soil AOI to the nearest downgradient surface water body may be used in the calculation of the $Soil_{GW3}$. Attenuation associated with mixing in the groundwater zone may be used in the calculation of the $Soil_{GW1}$ but a longitudinal dilution and attenuation factor shall not be applied to the $Soil_{GW1}$.

If the $Soil_{GW3}$ (after applying the DAF3) for a COC is less than the $Soil_{GW2}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 2 aquifer and the $Soil_{GW2}$ shall be identified as the $Soil_{GW}$ RS. A DAF2 (not a DAF3) shall be applied to the $Soil_{GW2}$. If the $Soil_{GW2}$ (after applying the DAF2) for a COC is less than the $Soil_{GW1}$, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ RS. A MO-3 $Soil_{GW}$ shall not result in an unacceptable constituent concentration (greater than GW_1 or GW_2) in deeper groundwater zones meeting the definition of Groundwater Classifications 1 or 2.

Note: In lieu of applying a MO-3 $Soil_{GW}$ RS to the soil AOI, the soil to groundwater pathway may be evaluated using a leach test.

(3) Calculate a site-specific $Soil_{sat}$ using EQ38;

(4) Identify the limiting soil MO-3 RS:

Surface soil (ground surface to 15 ft bgs):

(a) Compare: (1) the risk-based standard(s) calculated in Step (1), (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (2), and (3) the $Soil_{sat}$ calculated in Step (3); select the lowest of the three values as the limiting RS;

(b) Determine the AOIC for surface soil in accordance with Section 2.8; and

(c) Compare the surface soil AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COCs, then typically, no further evaluation is warranted for surface soil.

If the AOIC is greater than the limiting RS, then the surface soil shall be remediated to the MO-3 limiting RS.

Subsurface soil (> 15 ft bgs):

(a) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ calculated in Step (2), and (2) the $Soil_{sat}$ calculated in Step (3); select the lower of the two values as the limiting soil RS;

(b) Determine the AOIC for subsurface soil in accordance with Section 2.8;

(c) Compare the subsurface soil AOIC with the limiting RS:

If the AOIC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the subsurface soil is warranted.

If the AOIC is greater than the limiting RS, then the subsurface soil shall be evaluated further using a leach test or remediated to the MO-3 limiting RS.

The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs; and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

If the Department determines that impacted soil is a source medium only (exposure to impacted soil is not likely based on current or future land use and site-specific conditions), then it shall not be required that the risk-based standard for direct contact with soil ($Soil_{ni}$, $Soil_{i}$, $Soil_{ni}$-PEF $Soil_{i}$-PEF) be considered in the identification of the limiting RS.

If a limiting MO-3 RS is below the analytical quantitation limit, then the analytical quantitation limit shall be identified as the limiting soil RS. The analytical quantitation limit identified for application as a RS shall be the lowest quantitation limit available by routine analysis and shall be approved by the Department prior to use. A MO-3 Soil RS based on the analytical quantitation limit shall not be multiplied by a dilution and attentuation factor.

If the limiting soil MO-3 RS is below a Department-approved (refer to Section 2.13) background concentration, the background concentration shall be shall be identified as the limiting soil RS. A MO-3 soil RS based on an approved background concentration shall not be multiplied by a dilution and attenuation factor.

In applying the MO-3 limiting RS for the TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in soil shall not exceed 10,000 mg/kg (i.e., the sum of the residual concentrations for the TPH fractions and mixtures shall not exceed 10,000 mg/kg). Refer to Appendix D (Page D-3) for further guidance on addressing petroleum hydrocarbon releases.

For a non-detect result, the SQL shall be compared to the limiting MO-3 RS to document that the SQL is less than or equal to the limiting RS prior to eliminating the constituent from further evaluation under the RECAP.

Application of MO-3 soil RS shall not result in soil that exhibits hazardous waste characteristics of ignitability, corrosivity or reactivity as defined in the Hazardous Waste Regulations (LAC 33:V).

Environmental fate and transport models and site-specific and/or default inputs are subject to Department approval. Models provided by, or recommended by, the Department or EPA shall be used under RECAP unless otherwise approved by the Department.

H1.2 Groundwater Standards

Screening Option Overview:

1. Identify the GW_{SS} in Table 1;

2. Compare the GW_{SS} to the CC.

Management Options 1, 2, and 3 Overview for GW_1:

1. Identify the GW_1 in Table 3; and

2. Compare the GW_1 to the CC.

Management Options 1, 2, and 3 Overview for GW_2:

1. Identify the GW_2 (if applicable, multiply by DF2 or DAF2) and $Water_{sol}$ in Table 3;

2. If the GW2 zone is present at < 15 ft bgs, identify the GW_{air};

3. If the GW2 zone is present at < 15 ft bgs and an enclosed structure is over the AOI, identify the GW_{es};

4. Select the lower of these values as limiting groundwater RS; and

5. Compare the limiting groundwater RS to the CC.

Management Options 1, 2, and 3 Overview for GW_3:

1. Identify the GW_3 (if applicable, multiply by DF3 or DAF3) and $Water_{sol}$ in Table 3;

2. If the GW3 zone is present at < 15 ft bgs and a COC is volatile, identify the GW_{air};

3. If the GW3 zone is present at < 15 ft bgs and an enclosed structure is over the AOI, identify a GW_{es};

4. Select the lower of these values as limiting groundwater RS; and

5. Compare the limiting groundwater RS to the CC.

Detailed guidance on the identification and application of the groundwater RS is presented in the following sections.

H1.2.1 Screening Option

The groundwater SS (GW_{SS}) is defined in Section 2.12. The SO GW_{SS} are presented in Table 1 of the main document. For a constituent not listed in Table 1, the Submitter shall identify/calculate a GW_{SS} as presented below. The GW_{SS} requiring calculation shall be calculated using: 1) the spreadsheet at http://www.deq.state.la.us/technology/recap/; or 2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. The toxicity and chemical-specific values shall be obtained using the hierarchy of references listed in Table H-3.

For a non-detect result, the SQL shall be compared to the GW_{SS} to document that the SQL is less than or equal to the GW_{SS} prior to eliminating the constituent from further evaluation under the RECAP.

Identification and Application of the Groundwater Screening Standard for **Groundwater Classifications 1, 2, and 3:**

(1) Identify the GW_{SS} in Table 1. If a COC is not listed in Table 1, the MCL (http://www.epa.gov/ost/drinking/standards/) shall be identified as the GW_{SS}. If an MCL is not available, then a risk-based GW_{SS} shall be calculated using EQ39, EQ40, EQ41, or EQ42 in Section H2.2.1;

(2) For a COC not listed in Table 1, the $Water_{sol}$ shall be identified and compared to the GW_{SS} identified/calculated in Step (1). The lower of the two values shall be identified as the GW_{SS};

(3) Determine the compliance concentration (CC) (refer to Section 2.8.3) at the POC (refer to Section 2.11); and

(4) Compare the GW_{SS} to the CC:

If the CC is less than or equal to the GW_{SS}, then typically, no further evaluation of the groundwater shall be required.

If the CC for a COC exceeds the GW_{SS}, then the groundwater shall be evaluated under a Management Option or remediated to the GW_{SS}.

If the limiting GW_{SS} calculated by the Submitter is less than a Department-approved background concentration (Section 2.13) or analytical quantitation limit, then the Department-approved background concentration or analytical quantitation limit, respectively, shall be identified as the GW_{SS}. The analytical quantitation limit identified for application as the GW_{SS} shall be the lowest quantitation limit available by routine analysis and shall be approved by the Department prior to use.

For the generation of Table 1, the risk-based GW_{SS} was compared to the $Water_{sol}$ and the lower of the two values was entered in Table 1 as the GW_{SS}. The equations, input values, and worksheets used to calculate the GW_{SS} are presented later in this Appendix. The RfD, SF, and chemical-specific values used to calculate the GW_{SS} are presented in Tables H-1 and H-2. If the limiting GW_{SS} was less than the analytical quantitation limit (refer to Table H-4), then the analytical quantitation limit was presented as the SS in Table 1.

The procedures used in the development of the groundwater screening standard are illustrated in Figure 12 of the main document. Refer to Section 3.0 of the main document for further guidance on the screening process.

H1.2.2 Management Option 1

The MO-1 groundwater RS include GW_1, GW_2, GW_{3DW}, GW_{3NDW}, GW_{air}, and GW_{es}, and $Water_{sol}$ (refer to Section 2.12). The MO-1 groundwater RECAP Standards are presented in Table 3 of the main document. For constituents not included in Table 3, the Submitter shall identify/calculate a GW_1, GW_2, GW_{3DW}, GW_{3NDW}, GW_{air}, or GW_{es} in accordance with Sections H2.2.2, H2.2.3, H2.2.4, H2.2.5, and H2.2.6, respectively. The MO-1 groundwater RS requiring calculation shall be calculated using: 1) the spreadsheet at http://www.deq.state.la.us/technology/recap/; or 2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. The toxicity and chemical-specific values shall be obtained from the hierarchy of references listed in Table H-3. A MO-1 groundwater RS shall be developed for the exposure pathways, exposure scenarios, and land uses defined in Section 2.12. Site-specific data (with the exception of S_d and distance for the identification of the DF2 or DF3) shall not be used in the development of a MO-1 groundwater RS. Refer to Section 2.10 for guidance on determining the groundwater classification for the groundwater zone to be protected/restored. For a non-detect result, the SQL shall be compared to the limiting MO-1 RS to document that the SQL is less than or equal to the limiting RS prior to eliminating the constituent from further evaluation under the RECAP. If the release of volatile emissions from groundwater (< 15 ft bgs) to an enclosed structure is a pathway of concern at the AOI, include the GW_{es} from Table 3 in the identification of the limiting groundwater RS. For detailed guidance on the application of the GW_{es} RS refer to Section H1.2.3.4. Note: Indoor air sampling shall **not** be used under MO-1 for the evaluation of the volatile emissions from groundwater to an enclosed structure pathway.

<u>H1.2.2.1 MO-1 Evaluation of a Groundwater Classification 1 Aquifer</u>

(1) Identify the GW_1 in Table 3. If a COC is not listed in Table 3, the MCL (http://www.epa.gov/ost/drinking/standards/) shall be identified as the GW_1. If an MCL is not available, then a risk-based GW_1 shall be calculated using EQ39, EQ40, EQ41, or EQ42. If exposure to impacted groundwater is occurring (e.g., the groundwater is currently being used as a drinking water source) and more than one COC identified for MO-1 elicits effects on the same target organ/system, modify the GW_1 to account for additivity according to the guidelines presented in Appendix G;

(2) Identify the $Water_{sol}$ in Table 3. If the COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(3) If the GW_1 zone is present at < 15 ft bgs, identify the GW_{air} for the appropriate land use scenario (non-industrial or industrial). If more than one COC identified for the groundwater to ambient air pathway elicits noncarcinogenic critical effect or affects the same target organ/system, modify the GW_{air} to account for additivity according to the guidelines presented in Appendix G;

(4) Compare: (1) the GW_1 value obtained in Step (1); (2) the $Water_{sol}$ indentified in Step (2); and (3) the GW_{air} identified in Step (3); select the loweest of the three values as the limiting RS;

(5) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(6) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 limiting groundwater RS.

H1.2.2.2 MO-1 Evaluation of a Groundwater Classification 2 Aquifer

(1) Identify the GW_2 in Table 3. If a COC is not listed in Table 3, the MCL (http://www.epa.gov/ost/drinking/standards/) shall be identified as the GW_2. If an MCL is not available, then a risk-based GW_2 shall be calculated using EQ39, EQ40, EQ41, or EQ42. If exposure to impacted groundwater is occurring and more than one noncarcinogenic COC identified for MO-1 elicits effects on the same target organ/system, modify the GW_2 to account for additivity according to the guidelines presented in Appendix G;

(2) If the GW_2 in Table 3 is footnoted with DF2, identify the longitudinal dilution factor (DF2) to be applied to the GW_2 from the table below based on: (1) the shortest distance between the POC and the nearest downgradient property boundary (POE); and (2) the thickness of the groundwater source (S_d). (The S_d is defined as the thickness of the impacted groundwater within the permeable zone; refer to EQ66 and Figure H-1.) If the S_d is greater than 20 feet then a site-specific DAF shall be developed under MO-2 or MO-3. If the distance from the source is greater than 2000 feet, then: (1) the DF2 for 2000 feet shall be used under MO-1; or (2) a site-specific DAF2 shall be calculated under MO-2 or MO-3. **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented below are not valid and shall not be used. The Submitter may develop a site-specific DAF2 under MO-3.

Distance from POC to POE (feet)	MO-1 Longitudinal DF2 (dimensionless)			
	$S_d \leq 5$ ft	S_d = 6-10 ft	S_d = 11-15 ft	S_d = 16-20 ft
0 - 50	1.5	1	1	1
51 - 100	2.6	1.5	1.2	1.1
101 - 150	4.1	2.1	1.6	1.3
151 - 250	8.4	4.3	3	2.3
251 - 500	29	15	9.8	7.4
501 - 750	63	32	21	16
751 - 1000	111	57	37	28
1001 - 1250	173	86	58	43
1251 - 1500	248	124	83	62
1501 - 1750	337	169	113	84
1751 - 2000	440	220	147	110

(3) Multiply the GW_2 identified in Step (1) by the DF2 identified in Step (2). Note: If the GW_2 in Table 3 is not footnoted with a DF2, do not multiply by a DF2. If the GW_2 is to be applied at the POE (i.e., exposure to a COC in groundwater is occurring at the POE) do not multiply by a DF2. If the GW_2 (after applying the DF2) for a COC is less than the GW_1, then for that COC, the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the GW_1 shall be identified as the GW RS. The GW_1 RS shall not be multiplied by a DF;

(4) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3.

(5) If the GW2 zone is present at < 15 ft bgs, identify the GW_{air} in Table 3. If a COC is not listed in Table 3, calculate a GW_{air} using EQ55;

(6) Compare: (1) the product of GW_2 x DF2 obtained in Step (3); (2) GW_{air} identified in Step (5); and (3) the $Water_{sol}$ identified in Step (4); select the lowest of these values as the limiting groundwater RS.

(7) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(8) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 limiting groundwater RS.

NOTE: If a **POE is present** within the AOI for a Groundwater Classification 2 aquifer, compare the limiting RS (Note: A DF shall **not** be applied to a RS applied at the POE) to the COC concentration detected at the POE **and** compare the limiting RS (Note: A DF may be applied to a RS applied at the POC) to the concentration at the POC:

If the concentrations at the POE **and** the POC are less than or equal to the respective limiting groundwater RS, then typically, no further evaluation of the groundwater shall be required.

If the concentration at the POE is greater than the limiting groundwater RS, then the Submitter shall remediate to the limiting groundwater RS.

If the concentration at the POC is greater than the limiting groundwater RS, then the Submitter shall remediate to the limiting groundwater RS.

H1.2.2.3 MO-1 Evaluation of a Groundwater Classification 3 Aquifer

(1) Identify the nearest surface water body downgradient of the AOI and determine if the surface water body (segment or subsegment) is classified as a drinking water supply or a non-drinking water supply (refer to LAC 33:IX.Chapter 11) (http://www.deq.state.la.us/planning/regs/title33/33v09.pdf);

(2) Identify the GW_3 in Table 3 based on the use classification of the surface water body (segment or subsegment) (GW_{3NDW} for a surface water body classified as a non-drinking water supply or the GW_{3DW} for a surface water body classified as a drinking water supply). If COC is not listed in Table 3, then the appropriate human health protection criterion shall be identified in Table 1 of LAC 33:IX.1113 (http://www.deq.state.la.us/planning/regs/title33/33v09.pdf). If a COC is not listed in Table 1 of LAC 33:IX.1113, then a criterion shall be calculated in accordance with Section H2.2.4.

(3) If the GW_{3DW} or GW_{3NDW} in Table 3 is footnoted with a DF3, identify the longitudinal dilution factor (DF3) to be applied to the GW_{3NDW} or the GW_{3DW} in the table below based on: (1) the shortest distance between the POC and the nearest downgradient surface water body (POE); and (2) the thickness of the groundwater source (S_d). (The S_d is defined as the thickness of the impacted groundwater within the permeable zone. Refer to EQ66 and Figure H-1.) If the S_d is greater than 20 feet then a site-specific DAF3 shall be calculated under MO-2 or MO-3. If the distance from the source is greater than 2000 feet, then: (1) the DF3 for 2000 feet shall be used under MO-1; or (2) a site-specific DAF3 shall be calculated under MO-2 or MO-3. **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented below are not valid and shall not be used. The Submitter may develop a site-specific DAF3 under MO-3;

Distance from POC to POE (feet)	MO-1 Longitudinal DF3 (dimensionless)			
	$S_d \leq 5$ ft	S_d = 6-10 ft	S_d = 11-15 ft	S_d = 16-20 ft
0 - 50	1.5	1	1	1
51 - 100	2.6	1.5	1.2	1.1
101 - 150	4.1	2.1	1.6	1.3
151 - 250	8.4	4.3	3	2.3
251 - 500	29	15	9.8	7.4
501 - 750	63	32	21	16
751 - 1000	111	57	37	28
1001 - 1250	173	86	58	43
1251 - 1500	248	124	83	62
1501 - 1750	337	169	113	84
1751 - 2000	440	220	147	110

(4) Multiply the GW_{3NDW} or GW_{3DW} identified in Step (2) by the DF3 identified in Step (3). If the GW_{3DW} or GW_{3NDW} in Table 3 is not footnoted with a DF3, do not multiply the GW_{3DW} or GW_{3NDW} by a DF3. If the GW_3 (after applying the DF3) for a COC is less than the GW_2, then for that COC, the aquifer to be protected shall be managed as an aquifer meeting the definition of Groundwater Classification 2 and the GW_2 shall be identified as the GW RS. Note: A DF2 (not a DF3) shall be applied to the GW_2 if the GW_2 value is footnoted with a DF2 in Table 3. If the GW_2 (after applying the DF2) for a COC is less than the GW_1, then for that COC, the aquifer shall be managed as Groundwater 1 aquifer and the GW_1 shall be identified as the GW RS. Note: A DF shall not be applied to the GW_1 RS;

(5) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(6) If the GW3 zone is present at < 15 ft bgs, identify the GW_{air} in Table 3. If a COC is not listed in Table 3, calculate a GW_{air} using EQ55;

(7) Compare: (1) the product of GW_3 x DF3 obtained in Step (4); (2) the $Water_{sol}$ identified in Step (5); and (3) the GW_{air} identified in Step (6); select the lowest of these values as the limiting groundwater RS;

(8) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(9) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then the groundwater shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 limiting groundwater RS.

A limiting MO-1 groundwater RS shall not result in an unacceptable constituent concentration in deeper groundwater zones meeting the definition of Groundwater Classifications 1 or 2. If there is concern that a limiting MO-1 GW_3 may result in unacceptable constituent concentrations in a deeper Groundwater 1 or 2 Zone, the potential for constituent migration from the Groundwater 3 Zone to a Groundwater 1 or 2 Zone shall be addressed under MO-3. Criteria for this determination shall include constituent mobility, constituent concentration, vertical distance from Groundwater 3 Zone to a Groundwater 1 or 2 Zone, and probability of public/domestic well installation at or in the vicinity of the AOI.

If there is potential for exposure to constituents present in, or released from, groundwater via pathways not considered in the development of GW_1, GW_2, GW_3, GW_{air}, or GW_{es} then these pathways shall be addressed under MO-3.

If a MO-1 GW_1, GW_2 (after applying the DF2), or GW_3 (after applying the DF3) developed by a Submitter is below the analytical quantitation limit, then the analytical quantitation limit may be used as the limiting groundwater RS if determined to be appropriate by the Department. The analytical quantitation limit identified for application as the MO-1 GW RS shall be the lowest quantitation limit available by routine analysis and shall be approved by the Department prior to use. A MO-1 GW RS based on the analytical quantitation limit shall not be multiplied by a DF.

If the limiting MO-1 GW_1, GW_2 (after applying the DF2), or GW_3 (after applying the DF3), is less than the Department-approved (refer to Section 2.13) background concentration, then the background concentration shall be identified as the GW_3 RS. A MO-1 GW RS based on an approved background concentration shall not be multiplied by a DF.

In identifying and applying the MO-1 limiting RS, it should be noted that the total concentration of petroleum hydrocarbons in groundwater shall not exceed 10,000 mg/l. Refer to Appendix D for further guidance on addressing petroleum hydrocarbon releases.

The procedures to be used in the development of the groundwater RECAP Standards are presented in Figures 12, 14, and 15 of the main document.

Refer to Section 4.0 for further guidance on the implementation of MO-1.

For the generation of Table 3, the analytical quantitation limit was reported as the RS if the GW_1, GW_2, or GW_3 developed under MO-1 was below the analytical quantitation limit. The toxicity and chemical-specific values used to calculate the MO-1 groundwater RS are presented in Tables H-1 and H-2. The hierarchies of references used to obtain the toxicity and chemical-specific parameters are presented in Table H-3. The SQL values used in Table 3 are presented in Table H-4. The worksheets for the development of the MO-1 RS are presented at the end of this Appendix.

A limiting groundwater RECAP Standard shall not result in unacceptable exposure levels to construction workers or other receptors exposed to constituents present in, or released from, groundwater. If there is concern that unacceptable exposure to constituents present in, or released from groundwater may occur, then the pathway(s) of concern shall be evaluated under the appropriate Option.

The GW_2 and GW_3 RS standards do not authorize the migration of COC offsite to adjacent property but rather serves to evaluate the acceptability of constituent concentrations in the environment over time.

A GW_2 or GW_3 standard shall not result in a constituent concentration in groundwater that poses unacceptable health risk for other pathways of exposure. Based on site-specific conditions, the identification of more than one POC may be warranted. If the POE for one exposure pathway lies between the POC and POE for another exposure pathway, then the RS for both pathways shall be evaluated and if warranted, the RS and/or DF shall be adjusted such that exposure levels are acceptable at the points of exposure for both pathways (e.g., if the POE for the inhalation of volatile emissions released from groundwater to the ambient air or the inhalation of volatile emissions released from groundwater to an enclosed structure lies between the POC and the POE for a GW3 zone, then the GW_3, DF3, GW_{es}, and GW_{air} RS shall be evaluated, and if warranted, adjusted so that the COC concentrations potentially reaching all identified POE are acceptable).

H1.2.3 Management Option 2

The MO-2 groundwater RS include GW_1, $GW_{2,}$ GW_{3DW}, GW_{3NDW}, $Water_{sol}$, GW_{es}, and GW_{air} (refer to Section 2.12). The GW_1, $GW_{2,}$ GW_{3DW}, GW_{3NDW}, and $Water_{sol}$ shall be obtained from Table 3. For constituents not included in Table 3, the Submitter shall identify/calculate a GW_1, $GW_{2,}$ GW_{3DW} or GW_{3NDW} in accordance with Sections H2.2.2, H2.2.3, H2.2.4, H2.2.5, and H2.2.6, respectively. The MO-2 groundwater RS requiring calculation shall be calculated using: 1) the spreadsheet at http://www.deq.state.la.us/technology/recap/; or 2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. The toxicity and chemical-specific values shall be obtained form the hierarchy of references listed in Table H-3. A MO-2 groundwater RS shall only be developed for the exposure pathways, exposure scenarios, and land uses defined in Section 2.12. Refer to Section 2.10 for guidance on determining the groundwater classification for the groundwater zone to be protected/restored.

For a non-detect result, the SQL shall be compared to the MO-2 limiting RS to document that the SQL is less than or equal to the limiting RS prior to eliminating the COC from further evaluation of the RECAP.

H1.2.3.1 MO-2 Evaluation of a Groundwater Classification 1 Aquifer

(1) Identify the GW_1 in Table 3. If a COC is not listed in Table 3, identify the MCL (http://www.epa.gov/ost/drinking/standards/) as the GW_1. If an MCL is not available,

a risk-based GW_1 shall be calculated using EQ39, EQ40, EQ41, or EQ42. If exposure to impacted groundwater is occurring (e.g., the groundwater is currently being used as a drinking water source) and more than one noncarcinogenic COC identified for MO-2 elicits effects on the same target organ/system, the GW_1 shall be modified to account for additivity according to the guidelines presented in Appendix G;

(2) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(3) If the GW_1 zone is present at < 15 ft bgs, calculate a GW_{air} for the appropriate land use scenario (non-industrial or industrial) using EQ55. If more than one COC identified for the groundwater to ambient air pathway elicits the same noncarcinogenic critical effect or affects the same target organ/system, modify the GW_{air} to account for additivity according to the guidelines presented in Appendix G;

(4) Compare: (1) the GW_1 identified/calculated in Step (1); (2) the $Water_{sol}$ identified in Step (2); and (3) the GW_{air} identified in Step (3); select the loweest of the three values as the limiting groundwater RS;

(5) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(6) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting groundwater RS.

H1.2.3.2 MO-2 Evaluation of a Groundwater Classification 2 Aquifer

(1) Identify the GW_2 in Table 3. For a constituent not listed in Table 3, the MCL (http://www.epa.gov/ost/drinking/standards/) shall be identified as the GW_2. If an MCL is not available, a risk-based GW_2 shall be calculated using EQ39, EQ40, EQ41, or EQ42. If exposure to impacted groundwater is occurring and more than one noncarcinogenic COC identified for MO-2 elicits effects on the same target organ/system, the GW_2 shall be modified to account for additivity according to the guidelines presented in Appendix G;

(2) Calculate a site-specific DAF2 based on (1) the shortest distance between the POC and the nearest downgradient property boundary (POE); and (2) the thickness of the groundwater source (S_d) using EQ66 (refer to Section H2.5). If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 (refer to Section H1.1.2.1);

(3) Determine the product of GW_2 x DAF2 [If the limiting GW_2 (after applying the longitudinal DAF2) for a COC is less than the GW_1, then for that COC, the aquifer shall be managed as a Groundwater 1 aquifer and the GW_1 shall be identified as the limiting GW RS. A DAF shall not be applied to the GW_1 prior to application at the AOI.];

(4) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(5) If the GW2 zone is present at < 15 ft bgs, calculate a GW_{air} for the appropriate land use scenario (non-industrial or industrial) using EQ55. If more than one COC identified for the groundwater to ambient air pathway elicits noncarcinogenic effects on the same target organ/system, modify the GW_{air} to account for additivity according to the guidelines presented in Appendix G;

(6) Compare: (1) the product of GW_2 x DAF2 calculated in Step (3); (2) the $Water_{sol}$ identified in Step (4); and (3) if applicable, the GW_{air} identified in Step (5); select the lowest of these values as the limiting groundwater RS;

(7) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(8) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting groundwater RS.

A limiting MO-2 groundwater RS shall not result in an unacceptable constituent concentration in deeper groundwater zones. If there is concern that a limiting MO-2 GW_2 may result in unacceptable constituent concentrations in a deeper zone, the potential for constituent migration from the Groundwater 2 zone shall be addressed under MO-3. Criteria for this determination shall include constituent mobility, constituent concentration, vertical distance from Groundwater 2 zone to the next zone of concern, and probability of public/domestic well installation at or in the vicinity of the AOI.

If a **POE is present** within the AOI for a Groundwater Classification 2 aquifer, compare the limiting RS (Note: A DAF shall **not** be applied to a RS applied at the POE) to the COC concentration at the POE **and** compare the limiting RS (Note: A DAF may be applied to a RS applied at the POC) to the COC concentration at the POC:

If the COC concentrations at the POE **and** the POC are less than or equal to the respective limiting groundwater RS, then typically, no further evaluation shall be required.

If the COC concentration at the POE is greater than the limiting groundwater RS, then the Submitter shall remediate to the limiting groundwater RS.

If the COC concentration at the POC is greater than the limiting groundwater RS, then the Submitter shall remediate to the limiting groundwater RS.

H1.2.3.3 MO-2 Evaluation of a Groundwater Classification 3 Aquifer

(1) Identify the nearest downgradient surface water body and determine if the surface water body (segment or subsegment) to be protected is classified as a drinking water or a non-drinking water supply (refer to LAC 33:IX.Chapter 11) (http://www.deq.state.la.us/planning/regs/ title33/33v09.pdf);

(2) Identify the appropriate human health protection criterion in Table 3. If COC is not listed in Table 3, then the appropriate human health protection criterion shall be identfied in Table 1 of LAC 33:IX.1113 (http://www.deq.state.la.us/planning/regs/title33/33v09.pdf). If a COC is not listed in Table 1 of LAC 33:IX.1113, then a criterion shall be calculated in accordance with Section H2.2.4;

(3) Calculate a site-specific DAF3 based on (1) the shortest distance between the POC and the nearest downgradient surface water body (POE); and (2) the thickness of the groundwater source (S_d) using EQ66 (refer to Section H2.5). If the area of impacted soil is less than or equal to 0.5 acre, the S_d is less than or equal to 20 ft, and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF3 (refer to Section H1.1.2.1);

(4) Determine the product of GW_3 x DAF3 [If the limiting GW_3 (after applying the longitudinal DAF3) for a COC is less than the GW_2, then for that COC, the aquifer shall be managed as a Groundwater 2 aquifer and the GW_2 shall be identified as the limiting GW RS. Note: A DAF2 (not a DAF3) shall be applied to the GW_2. If the limiting GW_2 (after applying the longitudinal DAF2) is less than the GW_1, then the aquifer shall be managed as a Groundwater 1 aquifer and the GW_1 shall be identified as the limiting groundwater RS.];

(5) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(6) If the GW3 zone is present at < 15 ft bgs, calculate a GW_{air} for the appropriate land use scenario (non-industrial or industrial) using EQ55. If more than one COC identified for the groundwater to ambient air pathway elicits noncarcinogenic effects on the same target organ/system, modify the GW_{air} to account for additivity according to the guidelines presented in Appendix G;

(7) Compare: (1) the product of GW_3 x DAF3 calculated in Step (4); (2) the $Water_{sol}$ identified in Step (5); if applicable, the GW_{air} identified in Step (6); select the lowest of these values as the limiting groundwater RS;

(8) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(9) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting groundwater RS.

A limiting MO-2 groundwater RS shall not result in an unacceptable constituent concentration in deeper groundwater zones. If there is concern that a limiting MO-2 GW_3 may result in unacceptable constituent concentrations in a deeper zone, the potential for constituent migration from the Groundwater 3 zone shall be addressed under MO-3. Criteria for this determination shall include constituent mobility, constituent concentration, vertical distance from Groundwater 3 zone to the next zone of concern.

H1.2.3.4 MO-2 Evaluation of Groundwater Classification 1, 2, or 3 Aquifer Impacted with a Volatile Constituent Located Beneath an Enclosed Structure (GW_{es})

If the volatile emissions from groundwater (< 15 ft bgs) to an enclosed structure pathway is a concern throughout the groundwater AOI:

(1) Calculate a GW_{es} for the appropriate land use scenario (non-industrial or industrial) using EQ50. If more than one COC identified for the soil to enclosed structure pathway elicits noncarcinogenic effects on the same target organ/system or both soil and groundwater are contributing volatile emissions to the enclosed structure, modify the GW_{es} to account for additivity according to the guidelines presented in Appendix G.

Note: In lieu of applying a GW_{es} RECAP Standard at the AOI, soil gas sampling or indoor air sampling may be conducted (for further guidance on the evaluation of COC concentrations in indoor air refer to Section B2.5.15 of Appendix B and Sections H1.2.3.5 and H2.3 of this Appendix);

(2) Determine the GW_1, GW_2, or GW_3 in accordance with Section H1.2.3.1, H1.2.3.2, or H1.2.3.3, respectively;

(3) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(4) Compare: (1) the GW_{es} value calculated in Step (1); (2) the GW_1, GW_2, or GW_3 identified in Step (2); and (3) the $Water_{sol}$ identified in Step (3); select the lowest of these values as the limiting groundwater RS;

(5) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(6) Compare the CC to the limiting groundwater RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting groundwater RS.

If the volatile emissions from groundwater (< 15 ft bgs) to an enclosed structure pathway is a concern for only a portion of the groundwater AOI:

(1) Determine the GW_1, GW_2, or GW_3 in accordance with Section H1.2.3.1, H1.2.3.2, or H1.2.3.3, respectively;

(2) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(3) Compare: (1) the GW_1, GW_2, or GW_3 identified in Step (1); and (2) the $Water_{sol}$ identified in Step (2); select the lower of the two values as the limiting groundwater RS;

(4) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(5) Compare the CC to the limiting groundwater RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted for the household use of groundwater.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting groundwater RS.

(6) Calculate a GW_{es} for the appropriate land use scenario (non-industrial or industrial) using EQ50. If more than one constituent is present in groundwater that elicits noncarcinogenic effects on the same target organ/system or both soil and groundwater are contributing volatile emissions to the enclosed structure, modify the GW_{es} to account for additivity according to the guidelines presented in Appendix G.

Note: In lieu of applying a GW_{es} RECAP Standard at the AOI, soil gas sampling or indoor air sampling may be conducted (for further guidance on the evaluation of COC concentrations in indoor air refer to Section B2.5.15 of Appendix B and Sections H1.1.3.5 and H2.3 of this Appendix);

(7) Determine the CC (refer to Section 2.8.3) at the GW_{es} POC (the CC should be representative of the portion of the groundwater AOI beneath, or expected to migrate beneath, the enclosed structure);

(8) Compare the CC to the GW_{es}:

If the CC is less than or equal to the GW_{es} for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the GW_{es}, then groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting groundwater RS.

H1.2.3.5 MO-2 Evaluation of Groundwater Classification 1, 2, or 3 Aquifer (< 15 ft bgs) Impacted with a Volatile Constituent Located Beneath an Enclosed Structure Using Indoor Air Sampling

(1) Determine the GW_1, GW_2, or GW_3 in accordance with Section H1.2.3.1, H1.2.3.2, or H1.2.3.3, respectively;

(2) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(3) Compare: (1) the GW_1, GW_2, or GW_3 identified in Step (1); and (2) the $Water_{sol}$ identified in Step (2); select the lower of the these values as the limiting groundwater RS;

(4) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(5) Compare the CC to the limiting groundwater RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted for the pathways represented by the GW_1, GW_2, or GW_3 RS.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting groundwater RS.

(6) Determine the air COC concentration at the AOI in accordance with the guidelines in Appendix B;

(7) Determine the C_a in accordance with Section H2.3; compare the air COC concentration at the AOI with the C_a:

If the indoor air concentration is less than or equal to the C_a for all COCs, then typically, no further evaluation is warranted for the volatile emissions from groundwater to an enclosed structure pathway.

If the indoor air concentration is greater than the C_a, then the groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting GW_{es}.

H1.2.3.6 MO-2 Evaluation of Groundwater Classification 1, 2, or 3 Aquifer (< 15 ft bgs) Impacted with a Volatile Constituent Releasing Vapors to Ambient Air Using Air Sampling

(1) Determine the GW_1, GW_2, or GW_3 in accordance with Section H1.2.3.1, H1.2.3.2, or H1.2.3.3, respectively;

(2) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(3) Compare: (1) the GW_1, GW_2, or GW_3 identified in Step (1); and (2) the $Water_{sol}$ identified in Step (2); select the lower of the these values as the limiting groundwater RS;

(4) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(5) Compare the CC to the limiting groundwater RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted for the pathways represented by the GW_1, GW_2, or GW_3 RS.

If the CC is greater than the limiting RS, then groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting groundwater RS.

(6) Determine the air COC concentration at the AOI in accordance with the guidelines in Section B2.5.12 of Appendix B;

(7) Determine the C_a in accordance with Section H2.3; compare the air COC concentration at the AOI with the C_a:

If the air concentration is less than or equal to the C_a for all COC, then typically, no further evaluation is warranted for the volatile emissions from groundwater to air pathway.

If the air concentration is greater than the C_a, then the groundwater shall be further evaluated under MO-3 or remediated to the MO-2 limiting GW_{air}.

If the limiting groundwater MO-2 RS (after applying the longitudinal DAF) is less than the analytical quantitation limit, then the analytical quantitation limit shall be identified as the limiting groundwater RS. The analytical quantitation limit identified for application as the MO-2 RS shall be the lowest quantitation limit available by routine analysis and shall be approved by the Department prior to use. A DAF shall not be applied to a groundwater RS that is based on an analytical quantitation limit.

If the limiting groundwater MO-2 RS (after applying the longitudinal DAF) is less than the background concentration (as approved by the Department, refer to Section 2.13), then the background concentration shall be identified as the limiting groundwater RS. A DAF shall not be applied to a groundwater RS that is based on a background concentration.

If there is potential for unacceptable exposure to constituents present in groundwater via pathways not considered in the development of GW_1, GW_2, GW_3, GW_{es}, or GW_{air} then these pathways shall be addressed under MO-3.

A limiting groundwater RECAP Standard shall not result in unacceptable exposure levels to construction workers or other receptors exposed to constituents present in, or released from, groundwater. If there is concern that unacceptable exposure to constituents present in, or released from groundwater may occur, then the pathway(s) of concern shall be evaluated under the appropriate Option.

A GW RS shall not result in unacceptable constituent concentrations in a deeper groundwater zone. The criteria that the Department shall use to determine if this pathway should be addressed include constituent mobility, constituent concentration, distance from the impacted zone to un-impacted zone to be protected, and probability of well installation in the area of investigation. If there is concern that a limiting GW RS may result in unacceptable constituent concentrations in a deeper groundwater zone, then the potential for constituent migration shall be addressed under MO-3.

The GW_2 and GW_3 RS standards do not authorize the migration of COC offsite to adjacent property but rather serves to evaluate the acceptability of constituent concentrations in the environment over time.

A GW_2 or GW_3 standard shall not result in a constituent concentration in groundwater that poses unacceptable health risk for other pathways of exposure. Based on site-specific conditions, the identification of more than one POC may be warranted. If the POE for one exposure pathway lies between the POC and POE for another exposure pathway, then the RS for both pathways shall be evaluated and if warranted, the RS and/or DAF shall be adjusted such that exposure levels are acceptable at the points of exposure for both pathways (e.g., if the POE for the inhalation of volatile emissions released from groundwater to the ambient air or the inhalation of volatile emissions released from groundwater to an enclosed structure lies between the POC and the POE for a GW3 zone, then the GW_3, DAF3, GW_{es}, and GW_{air} RS shall be evaluated, and if warranted, adjusted so that the COC concentrations potentially reaching all identified POE are acceptable).

H1.2.4 Management Option 3

The MO-3 groundwater RS include GW_1, $GW_{2,}$ GW_{3DW}, GW_{3NDW}, $Water_{sol}$, GW_{es}, and GW_{air} (refer to Section 2.12). The GW_1, $GW_{2,}$ GW_{3DW}, GW_{3NDW}, and $Water_{sol}$ shall be obtained from Table 3. For constituents not included in Table 3, the Submitter shall identify/calculate a GW_1, $GW_{2,}$ GW_{3DW} or GW_{3NDW} in accordance with Sections H2.2.2, H2.2.3, and H2.2.4, respectively. The MO-3 groundwater RS requiring calculation shall be calculated using: 1) the spreadsheet at http://www.deq.state.la.us/technology/recap/; or 2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. The toxicity and chemical-specific values shall be obtained form the hierarchy of references listed in Table H-3. MO-3 groundwater RS shall be developed for all exposure pathways, exposure scenarios, and land uses identified in the CSM. Refer to Section 2.10 for guidance on determining the groundwater classification for the groundwater zone to be protected/restored. For a non-detect result, the SQL shall be compared to the MO-3 limiting RS to document that the SQL is less than or equal to the limiting RS prior to eliminating a constituent from the list of COC. Site-specific exposure data shall **not** be used in the development of a GW_1, GW_2, or GW_3 MO-3 RS. Site-specific exposure data may be used in the development of a GW_{es} and GW_{air} MO-3 RS. Site-specific data shall be representative of a reasonable maximum exposure scenario and are subject to Department approval. In the absence of site-specific data, standard default exposure parameters shall be used. Site-specific environmental fate and transport data may be used in the development of dilution and attenuation factors for GW_2 and GW_3, volatilization factors for GW_{es} and GW_{air}, and model input for the estimation of AOIC or exposure concentrations.

<u>H1.2.4.1 MO-3 Evaluation of a Groundwater Classification 1 Aquifer</u>

(1) Identify the GW_1 in Table 3. If a COC is not listed in Table 3, identify the MCL (http://www.epa.gov/ost/drinking/standards/) as the GW_1. If an MCL is not available, a risk-based GW_1 shall be calculated using EQ39, EQ40, EQ41, or EQ42. If exposure to impacted groundwater is occurring (e.g., the groundwater is currently being used as a drinking water source) and more than one noncarcinogenic COC identified for MO-3 elicits effects on the same target organ/system, the GW_1 shall be modified to account for additivity according to the guidelines presented in Section 2.14;

For the release of volatile emissions from groundwater to an enclosed structure pathway, a GW_{es} (EQ50) RS shall be calculated. If more than one COC identified for MO-3 elicits the same noncarcinogenic critical effect (or affects the same target organ/system), then the C_a shall be adjusted to account for potential additive health effects associated with simultaneous exposure to multiple noncarcinogens in accordance with the guidelines in Section 2.14. If volatile emissions are orginating from both soil and groundwater, then the C_a shall be adjusted to account for additivity associated with two sources of exposure. Note: In lieu of applying a MO-3 GW_{es} RS at the AOI, soil gas sampling or indoor air sampling may be conducted (for further guidance on the evaluation of COC concentrations in indoor air refer to Section B2.5.12 of Appendix B and Sections H1.2.3.5 and H2.3 of this Appendix). For the release of volatile emissions from groundwater to ambient air pathway, a GW_{air}

(EQ55) RS shall be calculated. If more than one COC identified for MO-3 elicits the same noncarcinogenic critical effect (or affects the same target organ/system), then the C_a shall be adjusted to account for potential additive health effects associated with simultaneous exposure to multiple noncarcinogens in accordance with the guidelines in Section 2.14.

(2) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(3) Compare: (1) the GW_1; and (2) the $Water_{sol}$; select the lower of the two values as the limiting groundwater RS. If other groundwater RS (e.g., GW_{es} or GW_{air}) are applicable at the AOI, these standards shall be included in the identification of the limiting RS;

(4) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(5) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be remediated to the MO-3 limiting groundwater RS.

<u>H1.2.4.2 MO-3 Evaluation of a Groundwater Classification 2 Aquifer</u>

(1) Identify the GW_2 in Table 3. For a constituent not listed in Table 3, the MCL (http://www.epa.gov/ost/drinking/standards/) shall be identified as the GW_2. If an MCL is not available, a risk-based GW_2 shall be calculated using EQ39, EQ40, EQ41, or EQ42. If exposure to impacted groundwater is occurring and more than one noncarcinogenic COC identified for MO-3 elicits the same critical effect or has the same target organ/system, the GW_2 shall be modified to account for additivity according to the guidelines presented in Section 2.14.

For the release of volatile emissions from groundwater to an enclosed structure pathway, a GW_{es} (EQ50) RS shall be calculated. If more than one COC identified for MO-3 elicits the same noncarcinogenic critical effect (or affects the same target organ/system), then the C_a shall be adjusted to account for potential additive health effects associated with simultaneous exposure to multiple noncarcinogens in accordance with the guidelines in Section 2.14. If volatile emissions are orginating from both soil and groundwater, then the C_a shall be adjusted to account for additivity associated with two sources of exposure. Note: In lieu of applying a MO-3 GW_{es} RS at the AOI, soil gas sampling or indoor air sampling may be conducted (for further guidance on the evaluation of COC concentrations in indoor air refer to Section B2.5.12 of Appendix B and Sections H1.2.3.5 and H2.3 of this Appendix).

The GW_2 may be multiplied by a site-specific dilution and attentuation factor (DAF2) to account for: (1) dilution of the COC concentration due to mixing within the groundwater zone (refer to Section H2.4) (the default value of 20 may be used for the $DF_{Summers}$); (2) dilution and attenuation of the COC concentration associated with the longitudinal migration of the groundwater for the source area (POC) to the nearest downgradient property boundary (POE) (refer to Section H2.5); and (3) COC degradation and retardation based on site-specific, quantitative data. The DAF2 is subject to Department approval.

(2) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(3) If the GW2 zone is present at < 15 ft bgs, calculate a GW_{air} for the appropriate land use scenario (non-industrial or industrial) using EQ55. If more than one COC identified for the groundwater to ambient air pathway elicits noncarcinogenic effects on the same target organ/system, modify the GW_{air} to account for additivity according to the guidelines presented in Appendix G;

(4) Compare: (1) the product of GW_2 x DAF2; (2) the $Water_{sol}$; and (3) the GW_{air} identified in Step (3); select the lowest of these values as the limiting groundwater RS. If other groundwater RS (e.g. GW_{es}) are applicable at the AOI, these standards shall be included in the identification of the limiting RS;

(5) Determine the CC (refer to Section 2.8.3) at the POC (refer to Section 2.11);

(6) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be remediated to the MO-3 limiting groundwater RS.

If a **POE is present** within the AOI for a Groundwater Classification 2 aquifer, compare the limiting RS (Note: A DF shall **not** be applied to a RS applied at the POE) to the concentration at the POE **and** compare the limiting limiting RS (Note: A DF may be applied to a RS applied at the POC) to the concentration at the POC:

If the concentrations at the POE **and** the POC are less than or equal to the respective limiting groundwater RS, then typically, no further evaluation shall be required.

If the concentration at the POE is greater than the limiting groundwater RS, then the Submitter shall remediate to the limiting groundwater RS.

If the concentration at the POC is greater than the limiting groundwater RS, then the Submitter shall remediate to the limiting groundwater RS.

If the limiting GW_2 (after applying the longitudinal DAF2) for a COC is less than the GW_1, then for that COC, the aquifer shall be managed as a Groundwater 1 aquifer and the

GW_1 shall be identified as the limiting GW RS. A DAF shall not be applied to the GW_1 prior to application at the AOI.

H1.2.4.3 MO-3 Evaluation of a Groundwater Classification 3 Aquifer

(1) Identify the nearest downgradient surface water body and determine if the surface water body (segment or subsegment) to be protected is classified as a drinking water (GW_{3DW}) or a non-drinking water (GW_{3NDW}) supply (refer to LAC 33:IX.Chapter 11) (http://www.deq.state.la.us/ planning/regs/ title33/33v09.pdf);

(2) Identify the appropriate human health protection criterion in Table 3. If a COC is not listed in Table 3, then the appropriate human health protection criterion shall be identfied in Table 1 of LAC 33:IX.1113 (http://www.deq.state.la.us/planning/regs/title33/33v09.pdf). If a COC is not listed in Table 1 of LAC 33:IX.1113, then a criterion shall be calculated in accordance with Section H2.2.3. If a GW_3 is not available in Table 3 or Table 1 of LAC 33:IX.1113, then a GW_3 shall be determined in accordance with Section H2.2.4.

For the release of volatile emissions from groundwater to an enclosed structure pathway, a GW_{es} (EQ50) RS shall be calculated. If more than one COC identified for MO-3 elicits the same noncarcinogenic critical effect (or affects the same target organ/system), then the C_a shall be adjusted to account for potential additive health effects associated with simultaneous exposure to multiple noncarcinogens in accordance with the guidelines in Section 2.14. If volatile emissions are orginating from both soil and groundwater, then the C_a shall be adjusted to account for additivity associated with two sources of exposure. Note: In lieu of applying a MO-3 GW_{es} RS at the AOI, soil gas sampling or indoor air sampling may be conducted (for further guidance on the evaluation of COC concentrations in indoor air refer to Section B2.5.12 of Appendix B and Sections H1.2.3.5 and H2.3 of this Appendix).

The GW_3 may be multiplied by a site-specific dilution and attentuation factor (DAF3) to account for: (1) dilution of the COC concentration due to mixing within the groundwater zone (refer to Section H2.4) (the default value of 20 may be used for the $DF_{Summers}$); (2) dilution and attenuation of the COC concentration associated with the longitudinal migration of the groundwater for the source area (POC) to the nearest downgradient surface water body (POE) (refer to Section H2.5); and (3) COC degradation and retardation based on site-specific, quantitative data. The DAF3 is subject to Department approval.

(3) Identify the $Water_{sol}$ in Table 3. If a COC is not listed in Table 3, obtain a water solubility value using the hierarchy of references listed in Table H-3;

(4) If the GW3 zone is present at < 15 ft bgs, calculate a GW_{air} for the appropriate land use scenario (non-industrial or industrial) using EQ55. If more than one COC identified for the groundwater to ambient air pathway elicits noncarcinogenic effects on the same target organ/system, modify the GW_{air} to account for additivity according to the guidelines presented in Appendix G;

(5) Compare: (1) the product of GW_3 x DAF3; (2) the $Water_{sol}$; and (3) the GW_{air} identified in Step (4); select the lowest of these values as the limiting groundwater RS. If other groundwater RS (e.g. GW_{es}) are applicable at the AOI, these standards shall be included in the identification of the limiting RS;

(6) Determine the CC (refer to Section 2.8.1) at the POC (refer to Section 2.11);

(7) Compare the CC to the limiting RS:

If the CC is less than or equal to the limiting RS for all COC, then typically, no further evaluation of the groundwater is warranted.

If the CC is greater than the limiting RS, then groundwater shall be remediated to the MO-3 limiting groundwater RS.

If the limiting GW_3 (after applying the longitudinal DAF3) for a COC is less than the GW_2 (after applying the DAF2), then for that COC, the aquifer shall be managed as a Groundwater 2 aquifer and the GW_2 shall be identified as the limiting GW RS. If the limiting GW_3 (after applying the DAF3) for a COC is less than the GW_1, then for that COC, the aquifer shall be managed as a Groundwater 1 aquifer and the GW_1 shall be identified as the limiting GW RS. A DAF shall not be applied to the GW_1 prior to application at the AOI.

A limiting MO-3 groundwater RS shall not result in unacceptable constituent concentrations in a deeper groundwater zone.

If a limiting MO-3 groundwater RS is below the analytical quantitation limit, then the analytical quantitation limit shall be identified as the limiting groundwater RS. The analytical quantitation limit identified for application as a RS shall be the lowest quantitation limit available by routine analysis and shall be approved by the Department prior to use. A MO-3 groundwater RS based on the analytical quantitation limit shall not be multiplied by a dilution and attentuation factor.

If the limiting groundwater MO-3 RS is below a Department-approved (refer to Section 2.13) background concentration, the background concentration shall be identified as the limiting groundwater RS. A MO-3 groundwater RS based on an approved background concentration shall not be multiplied by a dilution and attenuation factor.

In applying the MO-3 limiting RS for the TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in groundwater shall not exceed 10,000 mg/l (i.e., the sum of the residual concentrations for the TPH fractions and mixtures shall not exceed 10,000 mg/l). Refer to Appendix D (Page D-3) for further guidance on addressing petroleum hydrocarbon releases.

For a non-detect result, the SQL shall be compared to the limiting MO-3 RS to document that the SQL is less than or equal to the limiting RS prior to eliminating the constituent from evaluation under the RECAP.

A limiting MO-3 groundwater RECAP Standard shall not result in unacceptable exposure levels to construction workers or other receptors exposed to constituents present in, or released from, groundwater. If there is concern that unacceptable exposure to constituents present in, or released from groundwater may occur, then the pathway(s) of concern shall be evaluated.

The MO-3 GW_2 and GW_3 RS standards do not authorize the migration of COC offsite to adjacent property but rather serves to evaluate the acceptability of constituent concentrations in the environment over time.

A MO-3 GW_2 or GW_3 standard shall not result in a constituent concentration in groundwater that poses unacceptable health risks for other pathways of exposure. Based on site-specific conditions, the identification of more than one POC may be warranted. If the POE for one exposure pathway lies between the POC and POE for another exposure pathway, then the RS for both pathways shall be evaluated and if warranted, the RS and/or DAF shall be adjusted such that exposure levels are acceptable at the points of exposure for both pathways (e.g., if the POE for the inhalation of volatile emissions released from groundwater to the ambient air or the inhalation of volatile emissions released from groundwater to an enclosed structure lies between the POC and the POE for a GW3 zone, then the GW_3, DAF3, GW_{es}, and GW_{air} RS shall be evaluated, and if warranted, adjusted so that the COC concentrations potentially reaching all identified POE are acceptable).

H2.0 EQUATIONS FOR THE DEVELOPMENT OF SOIL AND GROUNDWATER SCREENING STANDARDS AND RECAP STANDARDS

H2.1 Soil Standards

Screening Standards for constituents not listed in Table 1, MO-1 RS for constituents not listed in Table 2, MO-2 RS, and MO-3 RS shall be calculated using: (1) the spreadsheets provided at http://www.deq.state.la.us/technology/recap/; or (2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. All calculations shall be included in the RECAP submittal. Where available, chemical-specific data presented in the worksheets at the end of this Appendix shall be used in the calculation of MO-2 and MO-3 RS. Refer to Section 2.15 for guidance for the identification of toxicity values.

H2.1.1 Risk-Based Standards – Non-industrial ($Soil_{SSni}$, $Soil_{ni}$, $Soil_{ni}$-PEF)

$Soil_{SSni}$ or $Soil_{ni}$ - Carcinogenic Effects - Organic Constituents (mg/kg):

$$\frac{TR\,x\,AT_c\,x\,365\,days\,/\,year}{EF_{ni}\,x\left[\left(SF_o\,x10^{-6}\,\frac{kg}{mg}\,x\,IRS_{adj}\right)+\left(SF_i\,x\,IRA_{adj}\,x\left(\frac{1}{VF_{ni}}\right)\right)+\left(SF_o\,x10^{-6}\,\frac{kg}{mg}\,x\,ABS\,x\,IRD_{adj}\right)\right]} \qquad \textbf{(EQ1)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	MO-1	MO-2	MO-3
$Soil_{SSni}$ or $Soil_{ni}$	non-industrial risk-based chemical concentration in soil (mg/kg)	--	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]	10^{-6} [b]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [c]	CS [c]	CS [c]	CS [c]
SF_i	inhalation cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [c]	CS [c]	CS [c]	CS [c]
AT_c	averaging time – carcinogens (yr)	70 [a]	70 [a]	70 [a]	70 [a]
EF_{ni}	exposure frequency, non-industrial (days/yr)	350 [a]	350 [a]	350 [a]	350 [a]
IRS_{adj}	age-adjusted soil ingestion rate (mg-yr/kg-day)	114 [d]	114 [d]	114 [d]	114 [d]
IRA_{adj}	age-adjusted inhalation rate (m^3-yr/kg-day)	11 [d]	11 [d]	11 [d]	11 [d]
IRD_{adj}	age-adjusted dermal contact rate (mg-yr/kg-day)	360 [d]	360 [d]	360 [d]	360 [d]
VF_{ni}	non-industrial soil-to-air volatilization factor (m^3/kg)	CS [c,e]	CS [c,e]	CS [c,e]	CS [c,e]
ABS	dermal absorption factor (unitless)	CS [c,f]	CS [c,f]	CS [c,f]	CS [c,f]

[a]*Soil Screening Guidance: User's Guide*, EPA 1996.
[b]Refer to Section 2.14.3.
[c]Chemical-specific.
[d]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[e]Refer to EQ12.
[f]Refer to Table H-6.

$Soil_{SSni}$ or $Soil_{ni}$- Carcinogenic Effects - Inorganic Constituents (mg/kg):

$$\frac{TR\ x\ AT_c\ x\ 365\, days\,/\,year}{EF_{ni}\ x\left[\left(SF_o\ x\,10^{-6}\ \frac{kg}{mg}\ x\ IRS_{adj}\right)+\left(SF_o\ x\,10^{-6}\ \frac{kg}{mg}\ x\ ABSxIRD_{adj}\right)\right]} \quad \textbf{(EQ2)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	**MO-1**	**MO-2**	**MO-3**
$Soil_{SSni}$ or $Soil_{ni}$	non-industrial risk-based chemical concentration in soil (mg/kg)	--	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]	10^{-6} [b]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [c]	CS [c]	CS [c]	CS [c]
AT_c	averaging time – carcinogens (yr)	70 [a]	70 [a]	70 [a]	70 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]	350 [a]
IRS_{adj}	age-adjusted soil ingestion rate (mg-yr/kg-day)	114 [d]	114 [d]	114 [d]	114 [d]
IRD_{adj}	age-adjusted dermal contact rate (mg-yr/kg-day)	360 [d]	360 [d]	360 [d]	360 [d]
ABS	dermal absorption factor (unitless)	CS [c,e]	CS [c,e]	CS [c,e]	CS [c,e]

[a]*Soil Screening Guidance: User's Guide*, EPA 1996.
[b]Refer to Section 2.14.3.
[c]Chemical-specific.
[d]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[e]Refer to Table H-6.

$Soil_{SSni}$ or $Soil_{ni}$ - Noncarcinogenic Effects - Organic Constituents (mg/kg):

$$\frac{THQ \, x \, BW_c \, x \, AT_{nc} \, x \, 365 \; days/yr}{EF_{ni} \, x \, ED_c \, x \left[\left(\left(\frac{1}{RfD_o} \right) x 10^{-6} \frac{kg}{mg} \, x \, IRS_c \right) + \left(\left(\frac{1}{RfD_i} \right) x \, IRA_c \, x \left(\frac{1}{VF_{ni}} \right) \right) + \left(\left(\frac{1}{RfD_o} \right) x \, SA_c \, x \, AF_c \, x \, ABS \, x 10^{-6} \frac{kg}{mg} \right) \right]} \qquad \textbf{(EQ3)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	**MO-1**	**MO-2**	**MO-3**
$Soil_{SSni}$ or $Soil_{ni}$	non-industrial risk-based chemical concentration in soil (mg/kg)	--	--	--	--
THQ	target hazard quotient (unitless)	0.1 [a]	1 [b]	1 [b]	1 [b]
RfD_o	oral chronic reference dose (mg/kg-day)	CS [c]	CS [c]	CS [c]	CS [c]
RfD_i	inhalation chronic reference dose (mg/kg-day)	CS [c]	CS [c]	CS [c]	CS [c]
BW_c	average child body weight ages 1-6 (kg)	15 [b]	15 [b]	15 [b]	15 [b]
AT_{nc}	averaging time - noncarcinogens, child (yr)	6 [b]	6 [b]	6 [b]	6 [b]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [b]	350 [b]	350 [b]	350 [b]
ED_c	child exposure duration ages 1-6 (yr)	6 [b]	6 [b]	6 [b]	6 [b]
IRS_c	child soil ingestion rate ages 1-6 (mg/day)	200 [b]	200 [b]	200 [b]	200 [b]
IRA_c	child inhalation rate ages 1-6 (m^3/day)	10 [d]	10 [d]	10 [d]	10 [d]
VF_{ni}	non-industrial soil-to-air volatilization factor (m^3/kg)	CS [c,e]	CS [c,e]	CS [c,e]	CS [c,e]
SA_c	child skin surface area (cm^2/day)	2800 [f]	2800 [f]	2800 [f]	2800 [f]
AF_c	child soil-to-skin adherence factor (mg/cm^2)	0.2 [f]	0.2 [f]	0.2 [f]	0.2 [f]
ABS	dermal absorption factor (unitless)	CS [c,g]	CS [c,g]	CS [c,g]	CS [c,g]

[a]LDEQ default value.
[b]*Soil Screening Guidance: User's Guide*, EPA 1996.
[c]Chemical-specific.
[d]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[e]Refer to EQ12.
[f]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*, EPA/540/R-99/005.
[g]Refer to Table H-6.

$Soil_{SSni}$ or $Soil_{ni}$ - Noncarcinogenic Effects - Inorganic Constituents (mg/kg):

$$\frac{THQ\,x\,BW_c\,x\,AT_{nc}\,x\,365\;days\,/\,yr}{EF_{ni}\,x\,ED_c\,x\left[\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\,\frac{kg}{mg}\,x\,IRS_c\right)+\left(\left(\frac{1}{RfD_o}\right)x\;SA_c\;x\;AF_c\;x\;ABS\;x\,10^{-6}\,\frac{kg}{mg}\right)\right]} \qquad \textbf{(EQ4)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	**MO-1**	**MO-2**	**MO-3**
$Soil_{SSni}$ or $Soil_{ni}$	non-industrial risk-based chemical concentration in soil (mg/kg)	--	--	--	--
THQ	target hazard quotient (unitless)	0.1 [a]	1 [b]	1 [b]	1 [b]
RfD_o	oral reference dose (mg/kg-day)	CS [c]	CS [c]	CS [c]	CS [c]
BW_c	average child body weight ages 1-6 (kg)	15 [b]	15 [b]	15 [b]	15 [b]
AT_{nc}	averaging time – noncarcinogens, child (yr)	6 [b]	6 [b]	6 [b]	6 [b]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [b]	350 [b]	350 [b]	350 [b]
ED_c	child exposure duration ages 1-6 (yr)	6 [b]	6 [b]	6 [b]	6 [b]
IRS_c	child soil ingestion rate ages 1-6 (mg/day)	200 [b]	200 [b]	200 [b]	200 [b]
SA_c	child skin surface area (cm^2/day)	2800 [d]	2800 [d]	2800 [d]	2800 [d]
AF_c	child soil-to-skin adherence factor (mg/cm^2)	0.2 [d]	0.2 [d]	0.2 [d]	0.2 [d]
ABS	dermal absorption factor (unitless)	CS [c,e]	CS [c,e]	CS [c,e]	CS [c,e]

[a]LDEQ default value.
[b]*Soil Screening Guidance: User's Guide*, EPA 1996.
[c]Chemical-specific.
[d]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[e]Refer to Table H-6.

$Soil_{ni}$-PEF - Carcinogenic Effects - Organic Constituents (mg/kg):

$$\frac{TR\,x\,AT_c\,x\,365\,days\,/\,year}{EF_{ni}\,x\left[\left(SF_o\,x\,10^{-6}\,kg\,/\,mg\,x\,IRS_{adj}\right)+\left(SF_i\,x\,IRA_{adj}\,x\left(\frac{1}{VF_{ni}}+\frac{1}{PEF_{ni}}\right)\right)+\left(SF_o\,x\,10^{-6}\,\frac{kg}{mg}\,x\,ABS\,x\,IRD_{adj}\right)\right]} \quad \textbf{(EQ5)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	MO-1	MO-2	MO-3
$Soil_{ni}$-PEF	non-industrial risk-based chemical concentration in soil (mg/kg)	NA [a]	NA [a]	--	--
TR	target excess individual lifetime cancer risk (unitless)	NA [a]	NA [a]	10^{-6} [b]	10^{-6} [c]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	NA [a]	NA [a]	CS [d]	CS [d]
SF_i	inhalation cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	NA [a]	NA [a]	CS [d]	CS [d]
AT_c	averaging time - carcinogens (yr)	NA [a]	NA [a]	70 [b]	70 [b]
EF_{ni}	non-industrial exposure frequency (days/yr)	NA [a]	NA [a]	350 [b]	350 [b]
IRS_{adj}	age- adjusted soil ingestion rate (mg-yr/kg-day)	NA [a]	NA [a]	114 [e]	114 [e]
IRA_{adj}	age-adjusted inhalation rate (m^3-yr/kg-day)	NA [a]	NA [a]	11 [e]	11 [e]
VF_{ni}	non-industrial soil-to-air volatilization factor (m^3/kg)	NA [a]	NA [a]	CS [d,f]	CS [d,f]
PEF_{ni}	non-industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	SS [g]	SS [g]
ABS	dermal absorption factor (unitless)	NA [a]	NA [a]	CS [d,h]	CS [d,h]
IRD_{adj}	age-adjusted dermal contact rate (mg-yr/kg-day)	NA [a]	NA [a]	360 [e]	360 [e]

[a]Not Applicable to this Option.
[b]*Soil Screening Guidance: User's Guide*, EPA 1996.
[c]Refer to Seciton 2.14.3.
[d]Chemical-specific.
[e]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[f]Refer to EQ12.
[g]Site-specific; Refer to EQ14.
[h]Refer to Table H-6.

$Soil_{ni}$-PEF - Carcinogenic Effects - Inorganic Constituents (mg/kg):

$$\frac{TR\,x\,AT_c\,x\,365\,days/year}{EF_{ni}\,x\left[\left(SF_o\,x\,10^{-6}\,kg/mg\,x\,IRS_{adj}\right)+\left(SF_i\,x\,IRA_{adj}\,x\left(\frac{1}{PEF_{ni}}\right)\right)+\left(SF_o\,x\,10^{-6}\,\frac{kg}{mg}\,x\,ABS\,x\,IRD_{adj}\right)\right]} \quad \textbf{(EQ6)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	**MO-1**	**MO-2**	**MO-3**
$Soil_{ni}$-PEF	non-industrial risk-based chemical concentration in soil (mg/kg)	NA [a]	NA [a]	--	--
TR	target excess individual lifetime cancer risk (unitless)	NA [a]	NA [a]	10^{-6} [b]	10^{-6} [c]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	NA [a]	NA [a]	CS [d]	CS [d]
SF_i	inhalation cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	NA [a]	NA [a]	CS [d]	CS [d]
AT_c	averaging time - carcinogens (yr)	NA [a]	NA [a]	70 [b]	70 [b]
EF_{ni}	non-industrial exposure frequency (days/yr)	NA [a]	NA [a]	350 [b]	350 [b]
IRS_{adj}	age-adjusted soil ingestion rate (mg-yr/kg-day)	NA [a]	NA [a]	114 [e]	114 [e]
IRA_{adj}	age-adjusted inhalation rate (m^3-yr/kg-day)	NA [a]	NA [a]	11 [e]	11 [e]
PEF_{ni}	non-industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	SS [f]	SS [f]
ABS	dermal absorption factor (unitless)	NA [a]	NA [a]	CS [d,g]	CS [d,g]
IRD_{adj}	age-adjusted dermal contact rate (mg-yr/kg-day)	NA [a]	NA [a]	360 [e]	360 [e]

[a]Not Applicable to this Option.
[b]*Soil Screening Guidance: User's Guide*, EPA 1996.
[c]Refer to Section 2.14.3.
[d]Chemical-specific.
[e]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[f]Site-specific; Refer to EQ14.
[g]Refer to Table H-6.

$Soil_{ni}$-PEF - Noncarcinogenic Effects - Organic Constituents (mg/kg):

$$\frac{THQ\ x\ BW_c\ x\ AT_{nc}\ x\ 365\ days\ /\ yr}{EF_{ni}\ x\ ED_c\ x\left[\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\frac{kg}{mg}x\ IRS_c\right)+\left(\left(\frac{1}{RfD_i}\right)x\ IRA_c\ x\left(\frac{1}{VF_{ni}}+\frac{1}{PEF_{ni}}\right)\right)+\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\frac{kg}{mg}x\ ABS\ x\ AF_c\ x\ SA_c\right)\right]}\ \textbf{(EQ7)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	MO-1	MO-2	MO-3
$Soil_{ni}$-PEF	non-industrial risk-based chemical concentration in soil (mg/kg)	NA [a]	NA [a]	--	--
THQ	target hazard quotient (unitless)	NA [a]	NA [a]	1	1
RfD_o	oral reference dose (mg/kg-day)	NA [a]	NA [a]	CS [b]	CS [b]
RfD_i	inhalation reference dose (mg/kg-day)	NA [a]	NA [a]	CS [b]	CS [b]
BW_c	average child body weight ages 1-6 (kg)	NA [a]	NA [a]	15 [c]	15 [c]
AT_{nc}	averaging time - noncarcinogens, child (yr)	NA [a]	NA [a]	6 [c]	6 [c]
EF_{ni}	non-industrial exposure frequency (days/yr)	NA [a]	NA [a]	350 [c]	350 [c]
ED_c	child exposure duration ages 1-6 (yr)	NA [a]	NA [a]	6 [c]	6 [c]
IRS_c	child soil ingestion rate ages 1-6 (mg/day)	NA [a]	NA [a]	200 [c]	200 [c]
IRA_c	child inhalation rate ages 1-6 (m^3/day)	NA [a]	NA [a]	10 [d]	10 [d]
VF_{ni}	non-industrial soil-to-air volatilization factor (m^3/kg)	NA [a]	NA [a]	CS [b,e]	CS [b,e]
PEF_{ni}	non-industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	SS [f]	SS [f]
ABS	dermal absorption factor (unitless)	NA [a]	NA [a]	CS [b,g]	CS [b,g]
AF_c	child soil-to-skin adherence factor (mg/cm^2)	NA [a]	NA [a]	0.2 [h]	0.2 [h]
SA_c	child skin surface area (cm^2/day)	NA [a]	NA [a]	2,800 [h]	2,800 [h]

[a]Not Applicable to this Option.
[b]Chemical-specific.
[c]*Soil Screening Guidance: User's Guide*, EPA 1996.
[d]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[e]Site-specific; refer to EQ12.
[f]Site-specific; refer to EQ14.
[g]Refer to Table H-6.
[h]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*, EPA/540/R-99/005.

$Soil_{ni}$-PEF - Noncarcinogenic Effects - Inorganic Constituents (mg/kg):

$$\frac{THQ\,x\,BW_c\,x\,AT_{nc}\,x\,365\,days/yr}{EF_{ni}\,x\,ED_c\,x\left[\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\frac{kg}{mg}\,x\,IRS_c\right)+\left(\left(\frac{1}{RfD_i}\right)x\,IRA_c\,x\left(\frac{1}{PEF_{ni}}\right)\right)+\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\frac{kg}{mg}\,x\,ABS\,x\,AF_c\,x\,SA_c\right)\right]} \quad \textbf{(EQ8)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	MO-1	MO-2	MO-3
$Soil_{ni}$-PEF	non-industrial risk-based chemical concentration in soil (mg/kg)	NA [a]	NA [a]	--	--
THQ	target hazard quotient (unitless)	NA [a]	NA [a]	1	1
RfD_o	oral reference dose (mg/kg-day)	NA [a]	NA [a]	CS [b]	CS [b]
RfD_i	inhalation reference dose (mg/kg-day)	NA [a]	NA [a]	CS [b]	CS [b]
BW_c	average child body weight ages 1-6 (kg)	NA [a]	NA [a]	15 [c]	15 [c]
AT_{nc}	averaging time - noncarcinogens, child (yr)	NA [a]	NA [a]	6 [c]	6 [c]
EF_{ni}	non-industrial exposure frequency (days/yr)	NA [a]	NA [a]	350 [c]	350 [c]
ED_c	child exposure duration ages 1-6 (yr)	NA [a]	NA [a]	6 [c]	6 [c]
IRS_c	child soil ingestion rate ages 1-6 (mg/day)	NA [a]	NA [a]	200 [c]	200 [c]
IRA_c	child inhalation rate ages 1-6 (m^3/day)	NA [a]	NA [a]	10 [d]	10 [d]
PEF_{ni}	non-industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	SS [e]	SS [e]
ABS	dermal absorption factor (unitless)	NA [a]	NA [a]	CS [b,f]	CS [b,f]
AF_c	child soil-to-skin adherence factor (mg/cm^2)	NA [a]	NA [a]	0.2 [g]	0.2 [g]
SA_c	child skin surface area (cm^2/day)	NA [a]	NA [a]	2,800 [g]	2,800 [g]

[a]Not Applicable to this Option.
[b]Chemical-specific.
[c]*Soil Screening Guidance: User's Guide*, EPA 1996.
[d]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[e]Site-specific; refer to EQ14.
[f]Refer to Table H-6.
[g]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.

EQ1 through EQ8 were obtained from *Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003. A RECAP Standard shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the RS.

IRA_{adj} (m^3-yr/kg-d):

$$\frac{IRA_c\,xED_c}{BW_c}+\frac{IRA_a\,xED_a}{BW_a} \qquad \textbf{(EQ9)}$$

where:

Parameter	Definition (units)	Input Value
IRA_{adj}	age-adjusted inhalation rate (m^3-yr/kg-day)	11
IRA_c	child inhalation rate ages 1-6 (m^3/day)	10
IRA_a	adult inhalation rate ages 7-31 (m^3/day)	20
ED_c	child exposure duration ages 1-6 (yr)	6
ED_a	adult exposure duration ages 7-31 (yr)	24
BW_c	average child body weight ages 1-6 (kg)	15
BW_a	average adult body weight ages 7-31 (kg)	70

IRS_{adj} (mg-yr/kg-d):

$$\frac{IRS_c\ x\ ED_c}{BW_c}+\frac{IRS_a\ x\ ED_a}{BW_a} \qquad \textbf{(EQ10)}$$

where:

Parameter	Definition	Input Value
IRS_{adj}	age-adjusted soil ingestion rate (mg-yr/kg-day)	114
BW_c	average child body weight ages 1-6 (kg)	15
BW_a	average adult body weight ages 7-31 (kg)	70
ED_c	child exposure duration ages 1-6 (yr)	6
ED_a	adult exposure duration ages 7-31 (yr)	24
IRS_c	child soil ingestion rate age 1-6 (mg/day)	200
IRS_a	adult soil ingestion rate ages 7-31 (mg/day)	100

IRD_{adj} (mg-yr/kg-d):

$$\frac{ED_c\, x AF_c\, x SA_c}{BW_c} + \frac{ED_a\, x AF_a\, x SA_a}{BW_a} \qquad \textbf{(EQ11)}$$

where:

Parameter	Definition (units)	Input Value
IRD_{adj}	age-adjusted dermal contact rate (mg-yr/kg-day)	360
ED_c	child exposure duration ages 1-6 (yr)	6
AF_c	child skin-to-soil adherence factor (mg/cm^2)	0.2
SA_c	child skin surface area (cm^2/day)	2,800
BW_c	average child body weight ages 1-6 (kg)	15
AF_a	adult skin-to-soil adherence factor (mg/cm^2)	0.07
ED_a	adult exposure duration ages 7-31 (yr)	24
SA_a	adult skin surface area (cm^2/day)	5,700
BW_a	average adult body weight ages 7-31 (kg)	70

EQ9, EQ10, and EQ11 were obtained from *Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003 and *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.

VF_{ni} (m^3/kg):

$$\frac{(Q/C)x(3.14xD_A xT)^{1/2}x10^{-4}(m^2/cm^2)}{(2x\rho_b xD_A)} \quad \textbf{(EQ12)}$$

where:

$$D_A(cm^2/s) = \frac{[(\theta_a{}^{10/3}xD_i xH' + \theta_w{}^{10/3}xD_w)/n^2]}{\rho_b xK_d + \theta_w + \theta_a xH'} \quad \textbf{(EQ13)}$$

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
VF_{ni}	non-industrial soil-to-air volatilization factor (m^3/kg)	--	--	--	--
D_A	apparent diffusivity (cm^2/s)	--	--	--	--
Q/C	inverse of the mean concentration at the center of source (g/m^2-s per kg/m^3)	EQ14	EQ14	SS [b]	SS [b]
T	exposure interval – carcinogens (s)	9.5E+08 [a]	9.5E+08 [a]	9.5E+08 [a]	9.5E+08 [a]
T	exposure interval – noncarcinogens (s)	1.9E+08 [a]	1.9E+08 [a]	1.9E+08 [a]	1.9E+08 [a]
ρ_b	dry soil bulk density (g/cm^3)	1.7 [c]	1.7 [c]	SS [d] (1.7)	SS [d] (1.7)
θ_a	air-filled soil porosity (L_{air}/L_{soil})	n-θ_w	n-θ_w	n-θ_w	n-θ_w
n	total soil porosity (L_{pore}/L_{soil})	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)
θ_w	water-filled soil porosity (L_{water}/L_{soil})	0.21 [c]	0.21 [c]	SS [d] (0.21)	SS [d] (0.21)
ρ_s	soil particle density (g/cm^3)	2.65 [c]	2.65 [c]	SS [d] (2.65)	SS [d] (2.65)
D_i	diffusivity in air (cm^2/s)	CS [e]	CS [e]	CS [e]	CS [e]
H'	Henry's Law Constant (dimensionless)	CS [e,f]	CS [e,f]	CS [e,f]	CS [e,f]
D_w	diffusivity in water (cm^2/s)	CS [e]	CS [e]	CS [e]	CS [e]
K_d	soil-water partition coefficient (cm^3/g) = K_{oc} x f_{oc}	CS [e]	CS [e]	CS [e]	CS [e]
K_{oc}	soil organic carbon partition coefficient (cm^3/g)	CS [e]	CS [e]	CS [e]	CS [e]
f_{oc}	fractional organic carbon in soil (g/g) = percent organic matter/174 (ASTM 2974)	0.006 [c]	0.006 [c]	SS [g] (0.006)	SS [g] (0.006)

[a]*Soil Screening Guidance*, *User's Guide,* EPA 1996.
[b]Site-specific; refer to EQ14.
[c]LDEQ default value.
[d]Site-specific.
[e]Chemical-specific.
[f]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^oK); and T = Absolute temperature of soil (^oK) [273 + ^oC (25^oC)].
[g]Site-specific; the sample(s) for f_{oc} determination shall be collected from an un-impacted area that is representative of the soil conditions in the impacted area.

Q/C (g/m²-s per kg/m³):

$$Ax\exp\left[\frac{(\ln A_c - B)^2}{C}\right] \qquad \textbf{(EQ14)}$$

where:

Parameter	Definition	Input Value
Q/C	inverse mean of constituent concentration at center of a square source (g/m^2-s per kg/m^3)	site-specific
A	constant [a]	13.6482
B	constant [a]	18.1754
C	constant [a]	206.7273
A_c	areal extent of site soil contamination (acres)	site-specific

[a]Constants for meteorological station Zone 6, Houston, Texas; *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, EPA March 2001.

The volatilization factor (VF) is used for defining the relationship between the concentration of constituents in soil and the volatilized constituents in air. The basic principle of the model is applicable only if the soil constituent concentration is at or below saturation. Saturation is the soil constituent concentration ($Soil_{sat}$) at which the adsorptive limits of the soil particles and the solubility limits of the available soil moisture have been reached. Above saturation, pure liquid-phase constituent may be present in the soil. It is important to recognize that free phase constituents may be present at concentrations below $Soil_{sat}$ if multiple constituents are present.

(Note: For organic constituents that are solid at ambient temperature, concentrations above $Soil_{sat}$ do not pose the potential for NAPL occurrence.) $Soil_{sat}$ concentrations represent an upper limit to the applicability of the VF model because a basic principle of the model (Henry's Law) does not apply where constituents are present in free phrase. Therefore, above saturation, the risk-based soil RS based on the VF model cannot be accurately calculated based on volatilization. Because of this limitation, the risk-based RS calculated using the VF must be compared with the $Soil_{sat}$ calculated using EQ38. If the $Soil_{ni}$ is greater than $Soil_{sat}$, then the risk-based RS is set equal to $Soil_{sat}$. $Soil_{sat}$ should be calculated using the same soil characteristics (bulk density, average water content, organic carbon content, etc.) used to calculate VF (*Soil Screening Guidance*, EPA 1996).

EQ12 and EQ13 were obtained from *Soil Screening Guidance: User's Guide*, EPA 1996. Site-specific data may be used where indicated. In the absence of site-specific data for a particular parameter, the default values presented in parentheses shall be used.

PEF_{ni} for EQ5, EQ6, EQ7, and EQ8 (m^3/kg):

$$Q/C x \frac{3{,}600 \sec/hr}{0.036 x (1-V) x (U_m/U_t)^3 x F(x)} \quad \textbf{(EQ15)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
PEF_{ni}	non-industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	--	--
Q/C	inverse of mean concentration at center of source (g/m^2-s per kg/m^3)	NA [a]	NA [a]	SS [b]	SS [b]
V	fraction of vegetative cover (unitless)	NA [a]	NA [a]	SS [c] (0.5)	SS [c] (0.5)
U_m	mean annual windspeed (m/s)	NA [a]	NA [a]	SS [c] (4.69)	SS [c] (4.69)
U_t	equivalent threshold value of windspeed at 7 m, (m/s)	NA [a]	NA [a]	SS [c] (11.32)	SS [c] (11.32)
F(x)	function dependent on U_m/U_t (unitless); derived using Cowherd et. al. (1985)[d]	NA [a]	NA [a]	SS [c,d] (0.194)	SS [c,d] (0.194)

[a]Not Applicable to this Option.
[b]Site-specific, refer to EQ14.
[c]Site-specific.
[d]Cowherd, C., G. Muleski, P. Engelhart, and D. Gillette. 1985. Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. Prepared for U.S. EPA, Office of Health and Environmental Assessment, Washington, DC. EPA/600/8-85/00. F(x) is a complex function of x, which is a ratio of the threshold windspeed and average annual windspeed:

$x = 0.886 \times [U_t/U_m]$

where:

U_t = equivalent threshold value of windspeed at 7 m, (m/s)

U_m = mean annual windspeed (m/s)

$$F(x) = \begin{cases} 1.91 & x < 0.5 \\ 2.06 - 0.33x & 0.5 < x < 0.8 \\ 2.6 - x & 0.8 < x < 1 \\ 2.9 - 1.3x & 1 < x < 2 \\ 0.18\,(8x^3 + 12x)\, e^{-x^2} & x > 2 \end{cases}$$

EQ15 was obtained from *Soil Screening Guidance: User's Guide*, EPA 1996. Site-specific data may be used where indicated. In the absence of site-specific data for a particular parameter, the default values presented in parentheses shall be used.

H2.1.2 Risk-Based Standards – Industrial ($Soil_{SSi}$, $Soil_i$, $Soil_i$-PEF)

$Soil_{SSi}$ or $Soil_i$ - Carcinogenic Effects - Organic Constituents (mg/kg):

$$\frac{TR x BW_a x AT_c x 365 days / yr}{EF_i x ED_i x \left[\left(SF_o x 10^{-6} \frac{kg}{mg} x IRS_i \right) + \left(SF_i x IRA_a x \left(\frac{1}{VF_i} \right) \right) + \left(SF_o x SA_i x AF_i x ABS x 10^{-6} \frac{kg}{mg} \right) \right]} \quad \textbf{(EQ16)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
$Soil_{SSi}$ or $Soil_i$	industrial risk-based chemical concentration in soil (mg/kg)	--	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]	10^{-6} [b]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [c]	CS [c]	CS [c]	CS [c]
SF_i	inhalation cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [c]	CS [c]	CS [c]	CS [c]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]	70 [a]
AT_c	averaging time - carcinogens (yr)	70 [a]	70 [a]	70 [a]	70 [a]
EF_i	industrial exposure frequency (days/yr)	250 [a]	250 [a]	250 [a]	SS [d] (250)
ED_i	industrial exposure duration (yr)	25 [a]	25 [a]	25 [a]	SS [d] (25)
IRS_i	industrial soil ingestion rate (mg/day)	50 [a]	50 [a]	50 [a]	SS [d] (50)
IRA_a	adult inhalation rate (m^3/day)	20 [e]	20 [e]	20 [e]	SS [d] (20)
VF_i	industrial soil-to-air volatilization factor (m^3/kg)	CS [f]	CS [f]	CS [f]	CS [f]
SA_i	skin surface area for an industrial worker (cm^2/day)	3,300 [e]	3,300 [e]	3,300 [e]	SS [d] (3,300)
AF_i	soil-to-skin adherence factor for an industrial worker (mg/cm^2)	0.2 [e]	0.2 [e]	0.2 [e]	SS [d] (0.2)
ABS	dermal absorption factor (unitless)	CS [g]	CS [g]	CS [g]	CS [g]

[a]*Soil Screening Guidance: User's Guide*, EPA 1996.
[b]Refer to Section 2.14.3.
[c]Chemical-specific.
[d]Site-specific.
[e]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[f]Chemical-specific; refer to EQ20.
[g]Chemical-specific; refer to Table H-6.

$Soil_{SSi}$ or $Soil_i$ - Carcinogenic Effects - Inorganic Constituents (mg/kg):

$$\frac{TR x BW_a x AT_c x 365 days/yr}{EF_i x ED_i x \left[\left(SF_o x 10^{-6}\frac{kg}{mg} x IRS_i\right) + \left(SF_o x SA_i x AF_i x ABS x 10^{-6}\frac{kg}{mg}\right)\right]} \quad \textbf{(EQ17)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
$Soil_{SSi}$ or $Soil_i$	industrial risk-based chemical concentration in soil (mg/kg)	--	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]	10^{-6} [b]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [c]	CS [c]	CS [c]	CS [c]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]	70 [a]
AT_c	averaging time - carcinogens (yr)	70 [a]	70 [a]	70 [a]	70 [a]
EF_i	industrial exposure frequency (days/yr)	250 [a]	250 [a]	250 [a]	SS [d] (250)
ED_i	industrial exposure duration (yr)	25 [a]	25 [a]	25 [a]	SS [d] (25)
IRS_i	industrial soil ingestion rate (mg/day)	50 [a]	50 [a]	50 [a]	SS [d] (50)
SA_i	skin surface area for an industrial worker (cm^2/day)	3,300 [e]	3,300 [e]	3,300 [e]	SS [d] (3,300)
AF_i	soil-to-skin adherence factor for an industrial worker (mg/cm^2)	0.2 [e]	0.2 [e]	0.2 [e]	SS [d] (0.2)
ABS	dermal absorption factor (unitless)	CS [f]	CS [f]	CS [f]	CS [f]

[a] *Soil Screening Guidance: User's Guide*, EPA 1996.
[b] Refer to Section 2.14.3.
[c] Chemical-specific.
[d] Site-specific.
[e] *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[f] Chemical-specific; refer to Table H-6.

$Soil_{SSi}$ or $Soil_i$ - Noncarcinogenic Effects - Organic Constituents (mg/kg):

$$\frac{THQ\,x\,BW_a\,x\,AT_{ni}\,x\,365 days/yr}{ED_i\,x\,EF_i\,x\left[\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\frac{kg}{mg}\,x\,IRS_i\right)+\left(\left(\frac{1}{RfD_i}\right)x\,IRA_a\,x\left(\frac{1}{VF_i}\right)\right)+\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\frac{kg}{mg}\,x\,SA_i\,x\,AF_i\,x\,ABS\right)\right]} \quad \textbf{(EQ18)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	**MO-1**	**MO-2**	**MO-3**
$Soil_{SSi}$ or $Soil_i$	industrial risk-based chemical concentration in soil (mg/kg)	--	--	--	--
THQ	target hazard quotient (unitless)	0.1	1 [a]	1 [a]	1 [a]
RfD_o	oral reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]	CS [b]
RfD_i	inhalation reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]	CS [b]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]	70 [a]
AT_{ni}	averaging time - noncarcinogens, industrial (yr)	25 [a]	25 [a]	25 [a]	SS [c] (25)
EF_i	industrial exposure frequency (days/yr)	250 [a]	250 [a]	250 [a]	SS [c] (250)
ED_i	industrial exposure duration (yr)	25 [a]	25 [a]	25 [a]	SS [c] (25)
IRS_i	industrial soil ingestion rate (mg/day)	50 [a]	50 [a]	50 [a]	SS [c] (50)
IRA_a	adult inhalation rate (m^3/day)	20 [d]	20 [d]	20 [d]	SS [c] (20)
VF_i	industrial soil-to-air volatilization factor (m^3/kg)	CS [e]	CS [e]	CS [e]	CS [e]
SA_i	skin surface area for an industrial worker (cm^2/day)	3,300 [d]	3,300 [d]	3,300 [d]	SS [c] (3,300)
AF_i	soil-to-skin adherence factor for an industrial worker (mg/cm^2)	0.2 [d]	0.2 [d]	0.2 [d]	SS [c] (0.2)
ABS	dermal absorption factor (unitless)	CS [f]	CS [f]	CS [f]	CS [f]

[a]*Soil Screening Guidance: User's Guide*, EPA 1996.
[b]Chemical-specific.
[c]Site-specific.
[d]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[e]Chemical-specific; refer to EQ20.
[f]Chemical-specific; refer to Table H-6.

$Soil_{SSi}$ or $Soil_i$ - Noncarcinogenic Effects - Inorganic Constituents (mg/kg):

$$\frac{THQ x BW_a x AT_{ni} x 365 days / yr}{ED_i x EF_i x \left[\left(\left(\frac{1}{RfD_o} \right) x 10^{-6} \frac{kg}{mg} x IRS_i \right) + \left(\left(\frac{1}{RfD_o} \right) x 10^{-6} \frac{kg}{mg} x SA_i x AF_i x ABS \right) \right]} \quad \textbf{(EQ19)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	**MO-1**	**MO-2**	**MO-3**
$Soil_{SSi}$ or Soili	industrial risk-based chemical concentration in soil (mg/kg)	0.1	1 [a]	1 [a]	1 [a]
THQ	target hazard quotient (unitless)	CS [b]	CS [b]	CS [b]	CS [b]
RfD_o	oral reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]	CS [b]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]	70 [a]
AT_{ni}	averaging time - noncarcinogens, industrial (yr)	25 [a]	25 [a]	25 [a]	SS [c] (25)
EF_i	industrial exposure frequency (days/yr)	250 [a]	250 [a]	250 [a]	SS [c] (250)
ED_i	industrial exposure duration (yr)	25 [a]	25 [a]	25 [a]	SS [c] (25)
IRS_i	industrial soil ingestion rate (mg/day)	50 [a]	50 [a]	50 [a]	SS [c] (50)
SA_i	skin surface area for an industrial worker (cm^2/day)	3,300 [d]	3,300 [d]	3,300 [d]	SS [c] (3,300)
AF_i	soil-to-skin adherence factor for an industrial worker (mg/cm^2)	0.2 [d]	0.2 [d]	0.2 [d]	SS [c] (0.2)
ABS	dermal absorption factor (unitless)	CS [e]	CS [e]	CS [e]	CS [e]

[a] *Soil Screening Guidance: User's Guide*, EPA 1996.
[b] Chemical-specific.
[c] Site-specific.
[d] *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[e] Chemical-specific; refer to Table H-6.

EQ16 through EQ19 were obtained from *Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003. A RECAP Standard shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the RS.

VF_i (m^3/kg):

$$\frac{(Q/C)x(3.14xD_A xT)^{1/2} x10^{-4}(m^2/cm^2)}{(2x\rho_b xD_A)} \quad \textbf{(EQ20)}$$

where:

$$D_A(cm^2/s) = \frac{[(\theta_a^{10/3} xD_i xH' + \theta_w^{10/3} xD_w)/n^2]}{\rho_b xK_d + \theta_w + \theta_a xH'} \quad \textbf{(EQ13)}$$

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
VF_i	industrial soil-to-air volatilization factor (m^3/kg)	--	--	--	--
D_A	apparent diffusivity (cm^2/s)	--	--	--	--
Q/C	inverse of the mean concentration at the center of source (g/m^2-s per kg/m^3)	79.25	79.25	SS [a]	SS [a]
T	exposure interval – industrial (s)	7.9E+08 [b]	7.9E+08 [b]	7.9E+08 [b]	SS [c] (7.9E+08)
ρ_b	dry soil bulk density (g/cm^3)	1.7 [d]	1.7 [d]	SS [c] (1.7)	SS [c] (1.7)
θ_a	air-filled soil porosity (L_{air}/L_{soil})	n-θ_w	n-θ_w	n-θ_w	n-θ_w
n	total soil porosity (L_{pore}/L_{soil})	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)
θ_w	water-filled soil porosity (L_{water}/L_{soil})	0.21 [d]	0.21 [d]	SS [c] (0.21)	SS [c] (0.21)
ρ_s	soil particle density (g/cm^3)	2.65 [d]	2.65 [d]	SS [c] (2.65)	SS [c] (2.65)
D_i	diffusivity in air (cm^2/s)	CS [e]	CS [e]	CS [e]	CS [e]
H'	Henry's Law Constant (dimensionless)	CS [e,f]	CS [e,f]	CS [e,f]	CS [e,f]
D_w	diffusivity in water (cm^2/s)	CS [e]	CS [e]	CS [e]	CS [e]
K_d	soil-water partition coefficient (cm^3/g) = K_{oc} x f_{oc}	CS [e]	CS [e]	CS [e]	CS [e]
K_{oc}	soil organic carbon partition coefficient (cm^3/g)	CS [e]	CS [e]	CS [e]	CS [e]
f_{oc}	fractional organic carbon in soil (g/g) = percent organic matter/174 (ASTM 2974)	0.006 [d]	0.006 [d]	SS [g] (0.006)	SS [g] (0.006)

[a]Site-specific; refer to EQ14.
[b]*Soil Screening Guidance*, *User's Guide,* EPA 1996.
[c] Site-specific.
[d]LDEQ default value.
[e]Chemical-specific.
[f]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^oK); and T = Absolute temperature of soil (^oK) [273 + ^oC (25^oC)].
[g]Site-specific, the sample(s) for f_{oc} determination shall be collected from an un-impacted area that is representative of the soil conditions in the impacted area.

The volatilization factor (VF) is used for defining the relationship between the concentration of constituents in soil and the volatilized constituents in air. The basic principle of the model is applicable only if the soil constituent concentration is at or below saturation. Saturation is the soil constituent concentration ($Soil_{sat}$) at which the adsorptive limits of the soil particles and the solubility limits of the available soil moisture have been reached. Above saturation, pure liquid-phase constituent may be present in the soil. It is important to recognize that free phase constituents may be present at concentrations below $Soil_{sat}$ if multiple constituents are present.

(Note: For organic constituents that are solid at ambient temperature, concentrations above $Soil_{sat}$ do not pose the potential for NAPL occurrence.) $Soil_{sat}$ concentrations represent an upper limit to the applicability of the VF model because a basic principle of the model (Henry's Law) does not apply where constituents are present in free phrase. Therefore, above saturation, the risk-based soil RS based on the VF model cannot be accurately calculated based on volatilization. Because of this limitation, the risk-based RS calculated using the VF must be compared with the $Soil_{sat}$ calculated using EQ38. If the $Soil_{ni}$ is greater than $Soil_{sat}$, then the risk-based RS is set equal to $Soil_{sat}$. $Soil_{sat}$ should be calculated using the same soil characteristics (bulk density, average water content, organic carbon content, etc.) used to calculate VF (*Soil Screening Guidance*, EPA 1996).

EQ13 and EQ20 were obtained from *Soil Screening Guidance: User's Guide*, EPA 1996. Site-specific data may be used where indicated. In the absence of site-specific data for a particular parameter that is designated as site-specific, the default value presented in paraentheses shall be used.

Soil$_i$-PEF - Carcinogenic Effects - Organic Constituents (mg/kg):

$$\frac{TR x BW_a x AT_c x 365 days/yr}{EF_i x ED_i x \left[\left(SF_o x 10^{-6}\frac{kg}{mg} x IRS_i\right)+\left(SF_i x IRA_a x\left(\frac{1}{VF_i}+\frac{1}{PEF_i}\right)\right)+\left(SF_o x SA_i x AF_i x ABS x 10^{-6}\frac{kg}{mg}\right)\right]} \qquad \textbf{(EQ21)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	**MO-1**	**MO-2**	**MO-3**
Soil$_i$-PEF	industrial risk-based chemical concentration in soil (mg/kg)	NA [a]	NA [a]	--	--
TR	target excess individual lifetime cancer risk (unitless)	NA [a]	NA [a]	10^{-6} [b]	10^{-6} [c]
SF_o	oral cancer slope factor ((mg/kg-day)$^{-1}$)	NA [a]	NA [a]	CS [d]	CS [d]
SF_i	inhalation cancer slope factor ((mg/kg-day)$^{-1}$)	NA [a]	NA [a]	CS [d]	CS [d]
BW_a	average adult body weight (kg)	NA [a]	NA [a]	70 [b]	70 [b]
AT_c	averaging time – carcinogens (yr)	NA [a]	NA [a]	70 [b]	70 [b]
EF_i	industrial exposure frequency (days/yr)	NA [a]	NA [a]	250 [b]	SS [e] (250)
ED_i	industrial exposure duration (yr)	NA [a]	NA [a]	25 [b]	SS [e] (25)
IRS_i	industrial soil ingestion rate (mg/day)	NA [a]	NA [a]	50 [b]	SS [e] (50)
IRA_a	adult inhalation rate (m^3/day)	NA [a]	NA [a]	20 [b]	SS [e] (20)
SA_i	skin surface area for an industrial worker (cm^2/day)	NA [a]	NA [a]	3,300 [f]	SS [e] (3,300)
AF_i	soil-to-skin adherence factor for an industrial worker (mg/cm^2)	NA [a]	NA [a]	0.2 [f]	SS [e] (0.2)
VF_i	industrial soil-to-air volatilization factor (m^3/kg)	NA [a]	NA [a]	CS [g]	CS [g]
PEF_i	industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	SS [h]	SS [h]
ABS	dermal absorption factor (unitless)	NA [a]	NA [a]	CS [i]	CS [i]

[a]Not Applicable to this Option.
[b]*Soil Screening Guidance: User's Guide*, EPA 1996.
[c]Refer to Section 2.14.3.
[d]Chemical-specific.
[e]Site-specific.
[f]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[g]Chemical-specific; refer to EQ20.
[h]Site-specific, refer to EQ25.
[i]Chemical-specific; refer to Table H-6.

$Soil_i$ - PEF - Carcinogenic Effects - Inorganic Constituents (mg/kg):

$$\frac{TR x BW_a x AT_c x 365 days/yr}{EF_i x ED_i x \left[\left(SF_o x 10^{-6} \frac{kg}{mg} x IRS_i \right) + \left(SF_i x IRA_a x \left(\frac{1}{PEF_i} \right) \right) + \left(SF_o x SA_i x AF_i x ABS x 10^{-6} \frac{kg}{mg} \right) \right]} \quad \textbf{(EQ22)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
$Soil_i$-PEF	industrial risk-based chemical concentration in soil (mg/kg)	NA [a]	NA [a]	--	--
TR	target excess individual lifetime cancer risk (unitless)	NA [a]	NA [a]	10^{-6} [b]	10^{-6} [c]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	NA [a]	NA [a]	CS [d]	CS [d]
SF_i	inhalation cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	NA [a]	NA [a]	CS [d]	CS [d]
BW_a	average adult body weight (kg)	NA [a]	NA [a]	70 [b]	70 [b]
AT_c	averaging time – carcinogens (yr)	NA [a]	NA [a]	70 [b]	70 [b]
EF_i	industrial exposure frequency (days/yr)	NA [a]	NA [a]	250 [b]	SS [e] (250)
ED_i	industrial exposure duration (yr)	NA [a]	NA [a]	25 [b]	SS [e] (25)
IRS_i	industrial soil ingestion rate (mg/day)	NA [a]	NA [a]	50 [b]	SS [e] (50)
IRA_a	adult inhalation rate (m^3/day)	NA [a]	NA [a]	20 [b]	SS [e] (20)
SA_i	skin surface area for an industrial worker (cm^2/day)	NA [a]	NA [a]	3,300 [f]	SS [e] (3,300)
AF_i	soil-to-skin adherence factor for an industrial worker (mg/cm^2)	NA [a]	NA [a]	0.2 [f]	SS [e] (0.2)
PEF_i	industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	SS [g]	SS [g]
ABS	dermal absorption factor (unitless)	NA [a]	NA [a]	CS [h]	CS [h]

[a]Not applicable to this Option.
[b]*Soil Screening Guidance: User's Guide*, EPA 1996.
[c]Refer to Section 2.14.3.
[d]Chemical-specific.
[e]Site-specific.
[f]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[g]Site-specific, refer to EQ25.
[h]Chemical-specific; refer to Table H-6.

Soil$_i$-PEF - Noncarcinogenic Effects - Organic Constituents (mg/kg):

$$\frac{THQ\,x\,BW_a\,x\,AT_{ni}\,x365days/yr}{ED_i\,x\,EF_i\,x\left[\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\frac{kg}{mg}x\,IRS_i\right)+\left(\left(\frac{1}{RfD_i}\right)x\,IRA_a\,x\left(\frac{1}{VF_i}+\frac{1}{PEF_i}\right)\right)+\left(\left(\frac{1}{RfD_o}\right)x\,SA_i\,x\,AF_i\,x\,ABS\,x10^{-6}\frac{kg}{mg}\right)\right]} \quad \textbf{(EQ23)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
Soil$_i$-PEF	industrial risk-based chemical concentration in soil (mg/kg)	NA [a]	NA [a]	--	--
THQ	target hazard quotient (unitless)	NA [a]	NA [a]	1 [b]	1 [b]
RfD_o	oral reference dose (mg/kg-day)	NA [a]	NA [a]	CS [c]	CS [c]
RfD_i	inhalation reference dose (mg/kg-day)	NA [a]	NA [a]	CS [c]	CS [c]
BW_a	average adult body weight (kg)	NA [a]	NA [a]	70 [b]	70 [b]
AT_{ni}	averaging time - noncarcinogens, industrial (yr)	NA [a]	NA [a]	25 [b]	SS [d] (25)
EF_i	industrial exposure frequency (days/yr)	NA [a]	NA [a]	250 [b]	SS [d] (250)
ED_i	industrial exposure duration (yr)	NA [a]	NA [a]	25 [b]	SS [d] (25)
IRS_i	industrial soil ingestion rate (mg/day)	NA [a]	NA [a]	50 [b]	SS [d] (50)
IRA_a	adult inhalation rate (m^3/day)	NA [a]	NA [a]	20 [b]	SS [d] (20)
SA_i	skin surface area for an industrial worker (cm^2/day)	NA [a]	NA [a]	3,300 [e]	SS [d] (3,300)
AF_i	soil-to-skin adherence factor for an industrial worker (mg/cm^2)	NA [a]	NA [a]	0.2 [e]	SS [d] (0.2)
VF_i	industrial soil-to-air volatilization factor (m^3/kg)	NA [a]	NA [a]	CS [f]	CS [f]
PEF_i	industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	SS [g]	SS [g]
ABS	dermal absorption factor (unitless)	NA [a]	NA [a]	CS [h]	CS [h]

[a]Not Applicable to this Option.
[b]*Soil Screening Guidance: User's Guide*, EPA 1996.
[c]Chemical-specific.
[d]Site-specific.
[e]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[f]Chemical-specific; refer to EQ20.
[g]Site-specific; refer to EQ25.
[h]Chemical-specific; refer to Table H-6.

$Soil_i$-PEF - Noncarcinogenic Effects - Inorganic Constituents (mg/kg):

$$\frac{THQ\,x\,BW_a\,x\,AT_{ni}\,x\,365 days/yr}{ED_i\,x\,EF_i\,x\left[\left(\left(\frac{1}{RfD_o}\right)x10^{-6}\frac{kg}{mg}\,x\,IRS_i\right)+\left(\left(\frac{1}{RfD_i}\right)x\,IRA_a\,x\left(\frac{1}{PEF_i}\right)\right)+\left(\left(\frac{1}{RfD_o}\right)x\,SA_i\,x\,AF_i\,x\,ABS\,x10^{-6}\frac{kg}{mg}\right)\right]} \quad \textbf{(EQ24)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
$Soil_i$-PEF	industrial risk-based chemical concentration in soil (mg/kg)	NA [a]	NA [a]	--	--
THQ	target hazard quotient (unitless)	NA [a]	NA [a]	1 [b]	1 [b]
RfD_o	oral reference dose (mg/kg-day)	NA [a]	NA [a]	CS [c]	CS [c]
RfD_i	inhalation reference dose (mg/kg-day)	NA [a]	NA [a]	CS [c]	CS [c]
BW_a	average adult body weight (kg)	NA [a]	NA [a]	70 [b]	70 [b]
AT_{ni}	averaging time - noncarcinogens, industrial (yr)	NA [a]	NA [a]	25 [b]	SS [d] (25)
EF_i	industrial exposure frequency (days/yr)	NA [a]	NA [a]	250 [b]	SS [d] (250)
ED_i	industrial exposure duration (yr)	NA [a]	NA [a]	25 [b]	SS [d] (25)
IRS_i	industrial soil ingestion rate (mg/day)	NA [a]	NA [a]	50 [b]	SS [d] (50)
IRA_a	adult inhalation rate (m^3/day)	NA [a]	NA [a]	20 [b]	SS [d] (20)
SA_i	skin surface area for an industrial worker (cm^2/day)	NA [a]	NA [a]	3,300 [e]	SS [d] (3,300)
AF_i	soil-to-skin adherence factor for an industrial worker (mg/cm^2)	NA [a]	NA [a]	0.2 [e]	SS [d] (0.2)
PEF_i	industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	SS [f]	SS [f]
ABS	dermal absorption factor (unitless)	NA [a]	NA [a]	CS [g]	CS [g]

[a]Not Applicable to this Option.
[b]*Soil Screening Guidance: User's Guide*, EPA 1996.
[c]Chemical-specific.
[d]Site-specific.
[e]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*. EPA/540/R-99/005.
[f]Site-specific; refer to EQ25.
[g]Chemical-specific; refer to Table H-6.

PEF_i (m^3/kg):

$$Q/Cx\frac{3{,}600\sec/hr}{0.036x(1-V)x(U_m/U_t)^3xF(x)} \qquad \textbf{(EQ25)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
PEF_i	industrial particulate emission factor (m^3/kg)	NA [a]	NA [a]	--	--
Q/C	inverse of mean concentration at center of source (g/m^2-s per kg/m^3)	NA [a]	NA [a]	SS [b]	SS [b]
V	fraction of vegetative cover (unitless)	NA [a]	NA [a]	SS [c] (0)	SS [c] (0)
U_m	mean annual windspeed (m/s)	NA [a]	NA [a]	SS [c] (4.69)	SS [c] (4.69)
U_t	equivalent threshold value of windspeed at 7 m, (m/s)	NA [a]	NA [a]	SS [c] (11.32)	SS [c] (11.32)
F(x)	function dependent on U_m/U_t (unitless); derived using Cowherd et. al. (1985)[d]	NA [a]	NA [a]	SS [c] (0.194)	SS [c] (0.194)

[a]Not Applicable to this Option.
[b]Site-specific, see EQ14.
[c]Site-specific.
[d]Cowherd, C., G. Muleski, P; Engelhart, and D. Gillette. 1985. Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. Prepared for U.S. EPA, Office of Health and Environmental Assessment, Washington, DC. EPA/600/8-85/002. F(x) is a complex function of x, which is a ratio of the threshold windspeed and average annual windspeed:

$x = 0.886 \times [U_t/U_m]$

where:

U_t = equivalent threshold value of windspeed at 7 m, (m/s)

U_m = mean annual windspeed (m/s)

$$F(x) = \begin{cases} 1.91 & x < 0.5 \\ 2.06 - 0.33x & 0.5 < x < 0.8 \\ 2.6 - x & 0.8 < x < 1 \\ 2.9 - 1.3x & 1 < x < 2 \\ 0.18\,(8x^3 -+ 12x)\; e^{-x^2} & x > 2 \end{cases}$$

EQ25 was obtained from *Soil Screening Guidance: User's Guide*, EPA 1996. Site-specific data may be used where indicated. In the absence of site-specific data for a particular parameter that is designated as site-specific, the default value presented in paraentheses shall be used.

H2.1.3 Volatile Emissions from Soil to an Enclosed Structure Pathway ($Soil_{es}$)

$Soil_{es}$ (mg/kg):

$$\frac{C_a\left[\frac{\mu g}{m^3}\right]}{VF_{Soiles}} x10^{-3}\frac{mg}{\mu g} \qquad \textbf{(EQ26)}$$

where:

Parameter	Definition (units)	SO	MO-1	MO-2	MO-3
$Soil_{es}$	soil RECAP Standard for soil impacted with volatile constituents located beneath an enclosed-structure (mg/kg)	NA [a]	--	--	--
C_a	risk-based chemical concentration in air for enclosed-structure (indoor) vapor inhalation (ug/m^3)	NA [a]	refer to Section H2.3	refer to Section H2.3	refer to Section H2.3
VF_{Soiles}	soil to enclosed-structure vapors volatilization factor (mg/m^3-air/mg-kg-soil)	NA [a]	EQ27 – EQ28 [b]	EQ27 – EQ28 [b]	EQ27 – EQ28 [b]

[a]Not applicable to this Option.
[b]Refer to EQ27 for non-industrial land use; refer to EQ28 for industrial land use.

$VF_{Soilesni}$ - Non-Industrial Scenario (mg/m^3/mg/kg):

$$\frac{\dfrac{H'\rho_b}{\theta_w + K_d\rho_b + H'\theta_a}\left[\dfrac{D_s / L_s}{ER_{ni}xL_{Bni}}\right]}{1+\dfrac{D_s / L_s}{ER_{ni}xL_{Bni}}+\left[\dfrac{D_s / L_s}{(D_{crack} / L_{crack})FC}\right]} x10^3\frac{cm^3-kg}{m^3-g} \qquad \textbf{(EQ27)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
$VF_{Soilesni}$	non-industrial soil vapors to enclosed-structure volatilization factor ($mg/m^3/mg/kg$)	NA [a]	--	--	--
H'	Henry's Law Constant (dimensionless)	NA [a]	CS [b,c]	CS [b,c]	CS [b,c]
ρ_s	soil particle density (g/cm^3)	NA [a]	2.65 [e]	SS [d] (2.65) [e]	SS [d] (2.65) [e]
ρ_b	dry soil bulk density (g/cm^3)	NA [a]	1.7 [e]	SS [d] (1.7 [e])	SS [d] (1.7 [e])
D_s	effective diffusion coefficient in soil based on vapor-phase concentration (cm^2/sec)	NA [a]	CS [b]	SS [f]	SS [f]
n	total soil porosity (L_{pore}/L_{soil})	NA [a]	$1-(\rho_b/\rho_s)$	$1-(\rho_b/\rho_s)$	$1-(\rho_b/\rho_s)$
L_s	depth from ground surface to impacted subsurface soils (cm)	NA [a]	100	SS [d] (100)	SS [d] (100)
θ_w	water-filled soil porosity (L_{water}/L_{soil})	NA [a]	0.21 [e]	SS [d] (0.21 [e])	SS [d] (0.21 [e])
K_d	soil-water partition coefficient (cm^3/g) = f_{oc} x K_{oc}	NA [a]	CS [b]	CS [b]	CS [b]
θ_a	air-filled soil porosity (L_{air}/L_{soil})	NA [a]	$n-\theta_w$	$n-\theta_w$	$n-\theta_w$
ER_{ni}	non-industrial enclosed-structure air exchange rate (1/s)	NA [a]	0.00014	SS [d] (0.00014)	SS [d] (0.00014)
L_{Bni}	non-industrial enclosed-structure volume/infiltration area ratio (cm)	NA [a]	200	SS [d] (200)	SS [d] (200)
D_{crack}	effective diffusion coefficient through foundation cracks (cm^2/s)	NA [a]	CS [b]	SS [g]	SS [g]
L_{crack}	enclosed-structure foundation or wall thickness (cm)	NA [a]	15	SS [d] (15)	SS [d] (15)
K_{oc}	soil organic carbon partition coefficient (cm^3/g)	NA [a]	CS [b]	CS [b]	CS [b]
f_{oc}	fractional organic carbon in soil (g/g); f_{oc} = percent organic matter/174 (ASTM 2974)	NA [a]	0.006 [e]	SS [h] (0.006) [e]	SS [h] (0.006) [e]
FC	areal fraction of cracks in foundation/walls (cm^2-cracks/cm^2 "total area")	NA [a]	0.01	SS [d] (0.01)	SS [d] (0.01)

[a]Not applicable for this Option.
[b]Chemical-specific.
[c]H' = H x 41 where: H = Henry's Law Constant ($atm\text{-}m^3/mol$); R = Universal Law Constant (0.0000821 $atm\text{-}m^3/mole\text{-}^oK$); and T = Absolute temperature of soil (^oK) [273 + ^oC (25^o C)].
[d]Site-specific; a default value demonstrated to be representative of site conditions may be used in the Johnson and Ettinger model if approved by the Department. Department approval for the use of an alternate default value shall be obtained prior to calculation of the $Soil_{es}$ RS.
[e]LDEQ default value.
[f]Site-specific; refer to EQ29.
[g]Site-specific; refer to EQ30.
[h]Site-specific; the sample(s) for f_{oc} determination shall be collected from an un-impacted area that is representative of the soil conditions in the impacted area.

$VF_{Soilesi}$ - Industrial Scenario (mg/m^3/mg/kg):

$$\frac{\dfrac{H'\rho_b}{\theta_w + K_d\rho_b + H'\theta_a}\left[\dfrac{D_s/L_s}{ER_i L_{Bi}}\right]}{1+\dfrac{D_s/L_s}{ER_i L_{Bi}}+\left[\dfrac{D_s/L_s}{(D_{crack}/L_{crack})xFC}\right]} x10^3 \frac{cm^3-kg}{m^3-g} \qquad \textbf{(EQ28)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	**MO-1**	**MO-2**	**MO-3**
$VF_{Soilesi}$	industrial soil vapors to enclosed-structure volatilization factor (mg/m^3/mg/kg)	NA [a]	--	--	--
H′	Henry's Law Constant (dimensionless)	NA [a]	CS [b,c]	CS [b,c]	CS [b,c]
ρ_s	soil particle density (gm/cm^3)	NA [a]	2.65 [e]	SS [d] (2.65) [e]	SS [d] (2.65) [e]
ρ_b	dry soil bulk density (g/cm^3)	NA [a]	1.7 [e]	SS [d] (1.7 [e])	SS [d] (1.7 [e])
D_s	effective diffusion coefficient in soil based on vapor-phase concentration (cm^2/sec)	NA [a]	CS [b]	SS [f]	SS [f]
n	total soil porosity (L_{pore}/L_{soil})	NA [a]	$1-(\rho_b/\rho_s)$	$1-(\rho_b/\rho_s)$	$1-(\rho_b/\rho_s)$
L_s	depth from ground surface to impacted subsurface soils (cm)	NA [a]	100	SS [d] (100)	SS [d] (100)
θ_w	water-filled soil porosity (L_{water}/L_{soil})	NA [a]	0.21 [e]	SS [d] (0.21 [e])	SS [d] (0.21 [e])
K_d	soil-water partition coefficient (cm^3/g) = f_{oc} x K_{oc}	NA [a]	CS [b]	CS [b]	CS [b]
θ_a	air-filled soil porosity (L_{air}/L_{soil})	NA [a]	$n-\theta_w$	$n-\theta_w$	$n-\theta_w$
ER_i	industrial enclosed-structure air exchange rate (1/s)	NA [a]	0.00023	SS [d] (0.00023)	SS [d] (0.00023)
L_{Bi}	industrial enclosed-structure volume/infiltration area ratio (cm)	NA [a]	300	SS [d] (300)	SS [d] (300)
D_{crack}	effective diffusion coefficient through foundation cracks (cm^2/s)	NA [a]	CS [b]	SS [g]	SS [d]
L_{crack}	enclosed-structure foundation or wall thickness (cm)	NA [a]	15	SS [d] (15)	SS [d] (15)
K_{oc}	soil organic carbon partition coefficient (cm^3/g)	NA [a]	CS [b]	CS [b]	CS [b]
f_{oc}	fractional organic carbon in soil (g/g); f_{oc} = percent organic matter/174 (ASTM 2974)	NA [a]	0.006 [e]	SS [h] (0.006) [e]	SS [h] (0.006) [e]
FC	areal fraction of cracks in foundation/walls (cm^2-cracks/cm^2 "total area")	NA [a]	0.01	SS [d] (0.01)	SS [d] (0.01)

[a]Not applicable for this Option.
[b]Chemical-specific.
[c]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^{o}K); and T = Absolute temperature of soil (^{o}K) [273 + ^{o}C (25^{o}C)].
[d]Site-specific; a default value demonstrated to be representative of site conditions may be used in the Johnson and Ettinger model if approved by the Department. Department approval for the use of an alternate default value shall be obtained prior to calculation of the $Soil_{es}$ RS.
[e]LDEQ default value.
[f]Site-specific; refer to EQ29.
[g]Stie-specific; refer to EQ30.
[h]Site-specific; the sample(s) for f_{oc} determination shall be collected from an un-impacted area that is representative of the soil conditions in the impacted area.

D_s (cm^2/s):

$$D_{air}\frac{\theta_a^{3.33}}{n^2}+D_{wat}\frac{1}{H'}\frac{\theta_w^{3.33}}{n^2} \qquad \textbf{(EQ29)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
D_s	effective diffusion coefficient in soil based on vapor-phase concentration (cm^2/s)	NA [a]	--	--	--
D_{air}	diffusion coefficient in air (cm^2/s)	NA [a]	CS [b]	CS [b]	CS [b]
θ_a	air-filled soil porosity (L_{air}/L_{soil})	NA [a]	n-θ_w	n-θ_w	n-θ_w
n	total soil porosity (L_{pore}/L_{soil})	NA [a]	1-(ρ_b/ρ_s)	1-(ρ_b/ρ_s)	1-(ρ_b/ρ_s)
D_{wat}	diffusion coefficient in water (cm^2/s)	NA [a]	CS [b]	CS [b]	CS [b]
H′	Henry's Law Constant (dimensionless)	NA [a]	CS [b,c]	CS [b,c]	CS [b,c]
ρ_b	dry soil bulk density (g/cm^3)	NA [a]	1.7 [e]	SS [d] (1.7) [e]	SS [d] (1.7) [e]
ρ_s	soil particle density (g/cm^3)	NA [a]	2.65 [e]	SS [d] (2.65) [e]	SS [d] (2.65) [e]
θ_w	water-filled soil porosity (L_{water}/L_{soil})	NA [a]	0.21 [e]	SS [d] (0.21) [e]	SS [d] (0.21) [e]

[a]Not Applicable for this Option.
[b]Chemical-specific.
[c]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^{o}K); and T = Absolute temperature of soil (^{o}K) [273 + ^{o}C (25^{o}C)].
[d]Site-specific; a default value demonstrated to be representative of site conditions may be used in the Johnson and Ettinger model if approved by the Department. Department approval for the use of an alternate default value shall be obtained prior to calculation of the $Soil_{es}$ RS.
[e]LDEQ default value.

D_{crack} (cm²/s):

$$D_{air}\frac{\theta_{acrack}^{3.33}}{n^2}+D_{wat}\frac{1}{H'}\frac{\theta_{wcrack}^{3.33}}{n^2} \qquad \textbf{(EQ30)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
D_{crack}	effective diffusion coefficient through foundation cracks (cm^2/s)	NA [a]	--	--	--
D_{air}	diffusion coefficient in air (cm^2/s)	NA [a]	CS [b]	CS [b]	CS [b]
θ_{acrack}	volumetric air content in foundation/wall cracks (L_{air}/L_{soil})	NA [a]	n-θ_{wcrack}	SS [c] (n-θ_{wcrack})	SS [c] (n-θ_{wcrack})
n	total porosity of foundation/wall (L_{pore}/L_{soil})	NA [a]	1-(ρ_b/ρ_s)	SS [c] [1-(ρ_b/ρ_s)]	SS [c] [1-(ρ_b/ρ_s)]
D_{wat}	diffusion coefficient in water (cm^2/s)	NA [a]	CS [b]	CS [b]	CS [b]
θ_{wcrack}	volumetric water content in foundation/wall cracks (L_{water}/L_{soil})	NA [a]	0.21 [d]	SS [c] (0.21 [d])	SS [c] (0.21 [d])
ρ_b	dry bulk density of foundation/wall (g/cm^3)	NA [a]	1.7 [d]	SS [c] (1.7) [d]	SS [c] (1.7) [d]
ρ_s	particle density of foundation/wall (g/cm^3)	NA [a]	2.65 [d]	SS [c] (2.65) [d]	SS [c] (2.65) [d]
H′	Henry's Law Constant (dimensionless)	NA [a]	CS [b,e]	CS [b,e]	CS [b,e]

[a]Not Applicable to this Option.
[b]Chemical-specific.
[c]Site-specific; a default value demonstrated to be representative of site conditions may be used in the Johnson and Ettinger model if approved by the Department. Department approval for the use of an alternate default value shall be obtained prior to calculation of the $Soil_{es}$ RS.
[d]LDEQ default value.
[e]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-°K); and T = Absolute temperature of soil (°K) [273 + °C (25°C)].

EQ26 through EQ30 were obtained from *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (*ASTM E 1739).* A RECAP Standard shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the RS. Additional information on the Johnson and Ettinger Model is available in *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (EPA November 2002).

H2.1.4 Soil to Groundwater Pathway

H2.1.4.1 Screening Option

SO $Soil_{SSGW}$ Method 1 - Soil/Water Partition Coefficient – Organic Constituents:

(1) The GW_1 shall be identified in Table 3. If a COC is not listed in Table 3, then a GW_1 shall be determined in accordance with Section H2.2.2. If the GW_1 is greater than the $Water_{sol}$, then the $Water_{sol}$ shall be identified as the acceptable concentration in groundwater and shall be used instead of the GW_1 in Step (2).

(2) The soil/water partition equation (C_{soil}) shall be used to relate the constituent concentration adsorbed to the soil organic carbon to the soil leachate concentration in the zone of contamination. The GW_1 identified in Step (1) shall be used as the target soil leachate concentration.

C_{soil} (mg/kg):

$$\frac{GW(\rho_b x K_d + \theta_W + \theta_a x H')}{\rho_b} \qquad \textbf{(EQ31)}$$

where:

Parameter	Definition (units)	SO Input Value
C_{soil}	concentration adsorbed to soil organic carbon (mg/kg dry weight)	--
GW	target soil leachate concentration (mg/L)	Groundwater RS identified in Step (1)
ρ_b	dry soil bulk density (g/cm^3)	1.7 [a]
θ_W	water filled soil porosity (L_{water}/L_{soil})	0.21[a]
K_d	soil-water partition coefficient = K_{oc} x f_{oc} (cm^3/g)	chemical-specific
K_{oc}	soil-organic carbon partition coefficient (cm^3/g)	chemical-specific
f_{oc}	fractional organic carbon in soil (g/g); f_{oc} = percent organic matter/174 (ASTM 2974)	0.006 [a]
θ_a	air filled soil porosity (L_{air}/L_{soil})	n-θ_w
n	total soil porosity (L_{pore}/L_{soil})	1 - ρ_b/ρ_s
ρ_s	soil particle density (g/cm^3)	2.65 [a]
H’	Henry’s Law Constant (dimensionless)	chemical-specific [b]

[a]LDEQ default value.
[b]H’ = H x 41 where: H = Henry’s Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^{o}K); and T = Absolute temperature of soil (^{o}K) [273 + ^{o}C (25^{o}C)].

If the most heavily impacted soils occur below the water table, then the term (θ_a H') should be omitted as all pores are water saturated. EQ31 was obtained from *Soil Screening Guidance: User's Guide*, EPA 1996.

(3) The constituent concentration adsorbed to soil organic carbon calculated in Step (2) shall be multiplied by a dilution factor (DF) of 20 to yield the maximum theoretical contaminant concentration in soil that is protective of the appropriate groundwater use. As chemicals present in the soil migrate, their concentrations are reduced by physical, chemical, and biochemical processes. To account for these processes, a dilution factor is used in the estimation of a soil concentration that is protective of groundwater. A DF of 20 shall be used for $Soil_{SSGW}$. A DF of 20 is considered protective of groundwater resources for soil sources up to 0.5 acre in size (*Soil Screening Guidance: Technical Background Document*, EPA 1996).

$Soil_{SSGW}$ (mg/kg):

(C_{soil}) x (20) **(EQ32)**

SO $Soil_{SSGW}$ Method 2 – TCLP Back-Calculation - Inorganic Constituents:

For inorganic constituents, the $Soil_{GW}$ shall be derived from the Toxicity Characteristic Leaching Procedure (TCLP) regulatory levels (Maximum Concentrations of Contaminants for the Toxicity Characteristic). The TCLP is an extraction process that assesses the leaching potential of constituents present in soil. TCLP regulatory levels represent maximum constituent concentrations in leachate that comply with the health-based criteria specified by the Safe Drinking Water Act for an assumed drinking water well downgradient of the source. The TCLP model assumes a dilution factor of 100 to account for dilution of the leachate in groundwater before reaching a drinking water well. Therefore, in general, the TCLP regulatory levels are 100 times the drinking water standard.

To determine the $Soil_{GW}$ from the TCLP regulatory level the TCLP regulatory level shall be multiplied by a factor of 20 to back-calculate to the corresponding "acceptable" concentration in soil. (A multiplier of 20 was used because the TCLP procedure requires the soil sample to be diluted 20:1 prior to acid extraction and leachate analysis.)

For inorganic constituents for which a TCLP regulatory level is not available, the $Soil_{GW}$ shall be estimated by multiplying the GW_1 by a dilution factor of 100 and then by a factor of 20. This back-calculation approach duplicates the assumptions and methods used in the development of TCLP regulatory levels and serves to identify an "acceptable" concentration in soil for those inorganic constituents for which a TCLP regulatory value was not available. *(Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristics Revisions; Final Rule,* EPA, 40 CFR Part 261 et. al.). Refer to Table 3 for the GW_1 value. If a COC is not listed in Table 3, identify/calculate a GW_1 in accordance with Section H2.2.2.

SO Soil$_{SSGW}$ Method 3 - Leach Test – Organic and Inorganic Constituents:

A leach test may be used instead of the soil/water partition equation to relate concentrations of constituents adsorbed to soil organic carbon to soil leachate concentrations in the impacted zone. The EPA Synthetic Precipitation Leaching Procedure (SPLP, EPA SW-846 Method 1312, U.S. EPA, 1994d) is the recommended leach test for evaluation of the soil to groundwater pathway. The SPLP was developed to model an acid rain leaching environment and is generally appropriate for an impacted soil scenario (*Soil Screening Guidance,* EPA 1996). The SPLP may not be appropriate for all situations thus alternative leach tests may be approved on a site-specific basis. In general, TCLP data will be considered acceptable if the data are current and appropriately represent site conditions for the evaluation of the soil to groundwater pathway.

The soil sample(s) to be submitted for SPLP should be collected from the most heavily impacted area(s) of the AOI. This sampling strategy allows for a worst case analysis of leach potential. If the results of the SPLP test (and appropriate application of dilution factors) indicate that soils do not pose an unacceptable leach potential, then all other locations at the AOI would also provide similar results. If SPLP testing (and appropriate application of dilution factors) indicates that soils from the most heavily impacted area(s) of the AOI pose an unacceptable leach potential, then additional soil samples surrounding the location are recommended to delineate the horizontal extent of impacts.

Refer to Section H1.1.1.2 for guidance on the application of the leach test results.

H2.1.4.2 Management Option 1

MO-1 Soil$_{GW}$ Method 1 - Soil/Water Partition Coefficient – Organic Constituents:

(1) Identify the appropriate groundwater RECAP Standard (GW_1, GW_2, GW_{3DW}, or GW_{3NDW}) in Table 3 based on the classification of the groundwater to be protected (refer to Section 2.10). If a COC is not listed in Table 3, a GW_1, GW_2, GW_{3DW}, or GW_{3NDW} shall be determined in accordance with Sections H2.2.2, H2.2.3, and H2.2.4, respectively. For GW_2 and GW_3, the site-specific DF shall **not** be applied to the GW_2 risk-based value or the GW_{3DW} or GW_{3NDW} limiting water quality criterion to define the target soil leachate concentration for the soil/water partition equation in Step (2). If the GW_1, GW_2, GW_{3DW}, or GW_{3NDW} is greater than the $Water_{sol}$, then the $Water_{sol}$ shall be used as the target soil leachate concentration in Step (2).

(2) The soil/water partition equation (C_{soil}) (EQ31) shall be used to relate the concentration of constituent adsorbed on soil organic carbon to the soil leachate concentration in the impacted zone. The GW_1, GW_2, GW_{3DW}, or GW_{3NDW} identified in Step (1) shall be used as the target soil leachate concentration.

(3) Multiply the C_{soil} obtained in Step (2) by a vertical DF of 20 [A DF of 20 is considered protective of groundwater resources for soil sources up to 0.5 acre in size (*Soil Screening Guidance: Technical Background Document*, EPA 1996).] to yield

the maximum theoretical contaminant concentration in soil that is protective of the appropriate groundwater use as follows:

$\text{Soil}_{GW1,\,2,\,or\,3}$ (mg/kg):

$$C_{soil} \times 20 \qquad \textbf{(EQ33)}$$

(4) Refer to Section H1.1.2.1 (2) for guidance on applying the MO-1 DF2 and DF3 to the SoilGW_2, and SoilGW_3, respectively.

MO-1 Soil_{GW} Method 2 – TCLP Back-Calculation - Inorganic Constituents:

For inorganic constituents, the Soil_{GW} shall be developed using an approach based on the Toxicity Characteristic Leaching Procedure (TCLP) regulatory levels (Maximum Concentrations of Contaminants for the Toxicity Characteristic). The TCLP is an extraction process that assesses the leaching potential of constituents present in soil. TCLP regulatory levels represent maximum constituent concentrations in leachate that comply with the health-based criteria specified by the Safe Drinking Water Act for an assumed drinking water well downgradient of the source. The TCLP model assumes a dilution factor of 100 to account for dilution of the leachate in groundwater before reaching a drinking water well. Therefore, in general, the TCLP regulatory levels are 100 times the drinking water standard.

To determine the Soil_{GW} from the TCLP regulatory level the TCLP regulatory level shall be multiplied by a factor of 20 to back-calculate to the corresponding "acceptable" concentration in soil. (A multiplier of 20 was used because the TCLP procedure requires the soil sample to be diluted 20:1 prior to acid extraction and leachate analysis.)

For inorganic constituents for which a TCLP regulatory level is not available, the Soil_{GW} shall be estimated by multiplying the GW_1 by a dilution factor of 100 and then by a factor of 20. This back-calculation approach duplicates the assumptions and methods used in the development of TCLP regulatory levels and serves to identify an "acceptable" concentration in soil for those inorganic constituents for which a TCLP regulatory value was not available. *(Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristics Revisions; Final Rule,* EPA, 40 CFR Part 261 et. al.). The GW_1 value shall be obtained from Table 3. If a COC is not listed in Table 3, a GW_1 shall be determined in accordance with Section H2.2.2.

MO-1 $Soil_{GW}$ Method 3 - Leach Test - Organic and Inorganic Constituents:

A leach test may be used instead of the soil/water partition equation to relate concentrations of constituents adsorbed to soil organic carbon to soil leachate concentrations in the impacted zone. The EPA Synthetic Precipitation Leaching Procedure (SPLP, EPA SW-846 Method 1312, U.S. EPA, 1994d) is the recommended leach test for evaluation of the soil to groundwater pathway. The SPLP was developed to model an acid rain leaching environment and is generally appropriate for an impacted soil scenario (*Soil Screening Guidance,* EPA April 1996). The SPLP may not be appropriate for all situations thus alternative leach tests may be approved on a site-specific basis. In general, TCLP data will be considered acceptable if the data are current and appropriately represent site conditions for the evaluation of the soil to groundwater pathway.

The soil sample(s) to be submitted for SPLP should be collected from the most heavily impacted area(s) of the AOI. This sampling strategy allows for a worst case analysis of leach potential. If the results of the SPLP test (and appropriate application of dilution factors) indicate that soils do not pose an unacceptable leach potential, then all other locations at the AOI would also provide similar results. If SPLP testing (and appropriate application of dilution factors) indicates that soils from the most heavily impacted area(s) of the AOI pose an unacceptable leach potential, then additional soil samples surrounding the location are recommended to delineate the horizontal extent of impacts.

Refer to Section H1.1.2.2 for guidelines on applying the leach test results.

The **Domenico analytical solute transport model** (Refer to Section H2.5, EQ65) was used to calculate the MO-1 default DF2 and DF3 values presented in Section H1.1 2.

H2.1.4.3 Management Option 2

MO-2 $Soil_{GW}$ Method 1 - Soil/Water Partition Coefficient - Organic Constituents:

(1) Identify the appropriate groundwater RS (GW_1, GW_2, GW_{3DW}, or GW_{3NDW}) in Table 3 based on the classification of the groundwater to be protected (refer to Section 2.10). If a COC is not listed in Table 3, a GW_1, GW_2, GW_{3DW}, or GW_{3NDW} shall be determined in accordance with Sections H2.2.2, H2.2.3, and H2.2.4, respectively. For GW_2 and GW_3, the site-specific DAF shall **not** be applied to the GW_2 risk-based value or the GW_{3DW} or GW_{3NDW} limiting water quality criterion to define the target soil leachate concentration for the soil/water partition equation in Step (2). If the GW_1, GW_2, GW_{3DW}, or GW_{3NDW} is greater than the $Water_{sol}$ (refer to Table 3) then the $Water_{sol}$ shall be used as the target soil leachate concentration in Step (2). If a COC is not listed in Table 3, a $Water_{sol}$ shall be obtained from an appropriate reference.

(2) The soil/water partition equation (C_{soil}) (EQ31) shall be used to relate the concentration of constituent adsorbed on soil organic carbon to the soil leachate concentration in the impacted zone. The GW_1, GW_2, GW_{3DW}, or GW_{3NDW} identified in Step (1) shall be used as the target soil leachate concentration.

(3) Calculate a site-specific $DF_{Summers}$ (refer to Section H2.4) (the default value of 20 may be used for the $DF_{Summers}$) and a site-specific DAF (refer to Section H2.5). If the area of impacted soil is less than or equal to 0.5 acre and site-specific environmental fate and transport data are not available, the Submitter shall use the MO-1 default DF2 or DF3 (refer to Section H1.1.2.1);

The site-specific $DF_{Summers}$ shall be developed using the Summers Model (refer to Section H2.4) or a default DF of 20 may be used (*Soil Screening Guidance*, EPA 1996). The $DAF_{Domencio}$ shall be developed using the Domenico analytical solute transport model (Domenico, P.A. and F.W. Schwartz, 1990. *Physical and Chemical Hydrogeology,* John Wiley and Sons, New York, N.Y.) (for the saturated zone) (refer to Section H2.5). The DAF2 is representative of dilution and attenuation of the constituent concentration associated with groundwater migration from the source area to the nearest downgradient property boundary. The DAF3 is representative of dilution and attenuation of the constituent concentration associated with groundwater migration from the source area to the nearest downgradient surface water body. If there is potential for constituent migration to be influenced by pumping activities within the zone, then a site-specific $DF_{Summers}$ and $DAF_{Domenico}$ shall not be used in the development of the $Soil_{GW}$.

(4) Multiply the C_{soil} calculated in Step (2) by the site-specific $DF_{Summers}$ (for $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, and $Soil_{GW3NDW}$) and the site-specific $DAF_{Domenico}$ (for $Soil_{GW2}$, $Soil_{GW3DW}$, and $Soil_{GW3NDW}$) calculated in Step (3) to yield the maximum theoretical constituent concentration in soil leachate that will not cause the groundwater RECAP Standard to be exceeded as follows:

For $Soil_{GW1}$:

$$Soil_{GW1} = C_{soil} \times DF_{Summers} \qquad \textbf{(EQ34)}$$

For $Soil_{GW2}$:

$$Soil_{GW2} = C_{soil} \times DF_{Summers} \times DAF2_{Domenico} \qquad \textbf{(EQ35)}$$

For $Soil_{GW3DW}$ or $Soil_{GW3NDW}$:

$$Soil_{GW3DW} \text{ or } Soil_{GW3NDW} = C_{soil} \times DF_{Summers} \times DAF3_{Domenico} \qquad \textbf{(EQ36)}$$

MO-2 $Soil_{GW}$ Method 2 – TCLP Back-Calculation - Inorganic Constituents:

For inorganic constituents, the $Soil_{GW}$ shall be developed using an approach based on the Toxicity Characteristic Leaching Procedure (TCLP) regulatory levels (Maximum Concentrations of Contaminants for the Toxicity Characteristic). The TCLP is an extraction process that assesses the leaching potential of constituents present in soil. TCLP regulatory levels represent maximum constituent concentrations in leachate that comply with the health-based criteria specified by the Safe Drinking Water Act for an assumed drinking water well downgradient of the source. The TCLP model assumes a dilution factor of 100 to account for dilution of the leachate in groundwater before reaching a drinking water well. Therefore, in general, the TCLP regulatory levels are 100 times the drinking water standard.

To determine the $Soil_{GW}$ from the TCLP regulatory level the TCLP regulatory level shall be multiplied by a factor of 20 to back-calculate to the corresponding "acceptable" concentration in soil. (A multiplier of 20 was used because the TCLP procedure requires the soil sample to be diluted 20:1 prior to acid extraction and leachate analysis.)

For inorganic constituents for which a TCLP regulatory level is not available, the $Soil_{GW}$ shall be estimated by multiplying the GW_1 by a dilution factor of 100 and then by a factor of 20. This back-calculation approach duplicates the assumptions and methods used in the development of TCLP regulatory levels and serves to identify an "acceptable" concentration in soil for those inorganic constituents for which a TCLP regulatory value was not available. *(Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristics Revisions; Final Rule,* EPA, 40 CFR Part 261 et. al.). The GW_1 shall be obtained from Table 3. If a COC is not listed in Table 3, then a GW_1 shall be determined in accordance with Section H2.2.2.

MO-2 $Soil_{GW}$ Method 3 - Leach Test - Organic and Inorganic Constituents:

A leach test may be used instead of the soil/water partition equation to relate concentrations of constituents adsorbed to soil organic carbon to soil leachate concentrations in the impacted zone. The EPA Synthetic Precipitation Leaching Procedure (SPLP, EPA SW-846 Method 1312, U.S. EPA, 1994d) is the recommended leach test for the soil to groundwater pathway. The SPLP was developed to model an acid rain leaching environment and is generally appropriate for an impacted soil scenario (*Soil Screening Guidance,* EPA April 1996). The SPLP may not be appropriate for all situations thus alternative leach tests may be approved on a site-specific basis. In general, TCLP data will be considered acceptable if the data are current and appropriately represent site conditions for the evaluation of the soil to groundwater pathway. An appropriate dilution and attenuation factor is to be applied to the results to determine if the COC concentration in the soil is protective of groundwater.

The soil sample(s) to be submitted for SPLP should be collected from the most heavily impacted area(s) of the AOI. This sampling strategy allows for a worst case analysis of leach potential. If the results of the SPLP test (and appropriate application of dilution factors) indicate that soils do not pose an unacceptable leach potential, then all other locations at the AOI would also provide similar results. If SPLP testing (and appropriate application of dilution factors) indicates that soils from the most heavily impacted area(s) of the AOI pose an unacceptable leach potential, then additional soil samples surrounding the location are recommended to delineate the horizontal extent of impacts.

Calculate a site-specific $DF_{Summers}$ and a site-specific $DAF_{Domenico}$ (refer to Sections H2.4 and H2.5); refer above to MO-2 $Soil_{GW}$ Method 1, Step (3). Refer to Section H1.1.3.2 for guidelines on applying the DAF and interpreting the leach test results.

MO-2 $Soil_{GW}$ Method 4 - Site-Specific Soil/Water Partition Coefficient - Organic and Inorganic Constituents:

A site-specific soil/water partition coefficient may be used to develop a site-specific $Soil_{GW}$ when: (1) groundwater and soil data are available; (2) groundwater concentrations are less than soil concentrations; and (3) groundwater data indicate the GW_1, GW_2, or GW_3 has been exceeded (to determine the appropriate groundwater RECAP Standard refer to the groundwater classifications presented in Section 2.10).

(1) Identify site-specific soil and groundwater concentrations (GW_{conc} and $Soil_{conc}$) that are representative of site-specific partitioning of the COC between soil and groundwater (e.g., the soil and groundwater sampled should be: (1) from the same location; (2) in communication with each other; (3) and at equilibrium and /or declining conditions.

(2) Identify the appropriate groundwater RECAP Standard based on the current or potential use of the impacted groundwater (See Section 2.10 for groundwater classifications) in Table 3. If a COC is not listed in Table 3, determine the groundwater RECAP Standard in accordance with Section H2.2.2, H2.2.3, or H2.2.4. For GW_2 and GW_3, the site-specific DAF shall **not** be applied to the GW_2 risk-based value or the GW_3 human health limiting water quality criterion to define the acceptable concentration in groundwater for the soil/water partition equation in Step (3).

(3) Calculate a site-specific water/soil partition coefficient using the site-specific soil and groundwater data identified in Step (1) and the groundwater RS identified in Step (2) as follows:

$Soil_{GW}$ (mg/kg):

$$\left(\frac{GW1,2or3}{GW_{conc}}\right)\left(Soil_{conc}\right) \qquad \textbf{(EQ37)}$$

where:

Parameter	Definition (units)	Input Value
$Soil_{GW}$	soil concentration protective of groundwater (mg/kg)	site-specific
$GW_{1, 2, or 3}$	groundwater RECAP Standard (mg/l)	refer to Section H2.2
GW_{conc}	site-specific groundwater concentration at the POC (mg/l)	site-specific
$Soil_{conc}$	site-specific soil concentration at the POC (mg/kg)	site-specific

(4) Calculate a site-specific $DF_{Summers}$ (EQ61) and a site-specific $DAF_{Domenico}$ (EQ65) (refer above to MO-2 $Soil_{GW}$ Method 1, Step (3);

(5) Multiply the $Soil_{GW}$ calculated in Step (3) by the site-specific $DF_{Summers}$ (for $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) and the site-specific $DAF_{Domenico}$ (for $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) calculated in Step (4) to yield the maximum theoretical constituent concentration in soil leachate that will not cause the groundwater RECAP Standard to be exceeded as follows:

For $Soil_{GW1}$:

$$Soil_{GW1} = C_{soil} \times DF_{Summers} \qquad \textbf{(EQ34)}$$

For $Soil_{GW2}$:

$$Soil_{GW2} = C_{soil} \times DF_{Summers} \times DAF2_{Domenico} \qquad \textbf{(EQ35)}$$

For $Soil_{GW3DW}$ and $Soil_{GW3NDW}$:

$$Soil_{GW3DW} \text{ or } Soil_{GW3NDW} = C_{soil} \times DF_{Summers} \times DAF3_{Domenico} \qquad \textbf{(EQ36)}$$

H2.1.5 Soil Saturation ($Soil_{sat}$) – Organic Constituents

$Soil_{sat}$ (mg/kg):

$$\frac{S}{\rho_b}(K_d\ \rho_b + \theta_w + H'\theta_a) \qquad \textbf{(EQ38)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	**MO-1**	**MO-2**	**MO-3**
$Soil_{sat}$	soil saturation concentration (mg/kg)	--	--	--	--
S	solubility in water (mg/L-water)	CS [a]	CS [a]	CS [a]	CS [a]
ρ_b	dry soil bulk density (g/cm^3)	1.7 [b]	1.7 [b]	SS [c] (1.7) [b]	SS [c] (1.7) [b]
K_d	soil-water partition coefficient = K_{oc} x f_{oc} (cm^3/g)	CS [a]	CS [a]	CS [a]	CS [a]
K_{oc}	soil-organic carbon partition coefficient (cm^3/g)	CS [a]	CS [a]	CS [a]	CS [a]
f_{oc}	fraction organic carbon of soil = percent organic matter/174 (g/g) (ASTM 2974)	0.006 [b]	0.006 [b]	SS [d] (0.006) [b]	SS [d] (0.006) [b]
θ_w	water-filled soil porosity (L_{water}/L_{soil})	0.21 [b]	0.21 [b]	SS [c] (0.21) [b]	SS [c] (0.21) [b]
H'	Henry's Law Constant (dimensionless)	CS [a,e]	CS [a,e]	CS [a,e]	CS [a,e]
θ_a	air-filled soil porosity (L_{air}/L_{soil})	n - θ_w	n - θ_w	n - θ_w	n - θ_w
ρ_s	soil particle density (g/cm^3)	2.65 [b]	2.65 [b]	SS [c] (2.65) [b]	SS [c] (2.65) [b]
n	total soil porosity (L_{pore}/L_{soil})	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)	1 - (ρ_b/ρ_s)

[a]Chemical-specific.
[b]LDEQ default value.
[c]Site-specific.
[d]Site-specific; the sample(s) for f_{oc} determination shall be collected from an un-impacted area that is representative of the soil conditions in the impacted area.
[e]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^{o}K); and T = Absolute temperature of soil (^{o}K) [273 + ^{o}C (25^{o}C)].

EQ38 was obtained from *Soil Screening Guidance: User's Guide,* EPA 1996. In the absence of site-specific data the default values presented in parentheses shall be used.

Note: The $Soil_{sat}$ is not applicable to constituents that are in a solid phase at ambient temperatures (i.e., constituents having melting points equal to or greater than 20^{o}C).

H2.2 Groundwater Standards

Groundwater SS or RS requiring calculation shall be calculated using: (1) the spreadsheets provided at http://www.deq.state.la.us/technology/recap/; or (2) a spreadsheet or computer program that generates an output that is consistent with the output of the LDEQ spreadsheet. All calculations shall be included in the RECAP submittal. Where available, chemical-specific data presented in the worksheets at the end of this Appendix shall be used.

H2.2.1 Groundwater Screening Standard – Risk-based Standard (GW_{SS})

Under the Screening Option, the GW_{SS} is applicable to groundwater meeting Groundwater Classifications 1, 2, and 3 (refer to Section 2.10 for the groundwater classifications). For constituents not listed in Table 1, the MCL shall serve as the GW_{SS}. If an MCL is not available, then a risk-based GW_{SS} shall be calculated as follows:

GW_{SS} - Carcinogenic Effects - Volatile Constituents (mg/l):

$$\frac{TR x AT_c x 365 days/yr}{EF_{ni} x[(SF_i x K_w x IRA_{adj})+(SF_o x IRW_{adj})]} \qquad \textbf{(EQ39)}$$

where:

Parameter	Definition (units)	SO Input Value
GW_{SS}	risk-based chemical concentration in water (mg/L)	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [b]
SF_i	inhalation cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [b]
AT_c	averaging time - carcinogens (yr)	70 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]
IRW_{adj}	age-adjusted water ingestion rate (L-yr/kg-day)	1.1 [a]
IRA_{adj}	age-adjusted inhalation rate (m^3-yr/kg-day)	11 [a]
K_w	water-to-indoor air volatilization factor (L/m^3)	0.5 [c,d]

[a] *Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b] Chemical-specific.
[c] *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual Part B Development of Risk-Based Preliminary Remedial Goals*, EPA 1991.
[d] The water-air concentration relationship represented by the volatilization factor (K_w) is applicable only to chemicals with a Henry's Law Constant of greater than 1E-05 atm-m^3/mole and a molecular weight of less than 200 g/mole.

GW_{SS} - Noncarcinogenic Effects - Volatile Constituents (mg/l):

$$\frac{THQ \; x \; BW_a \; x \; AT_{nni} \; x \; 365 \; days/yr}{EF_{ni} \; x \; ED_{ni} \; x \left[\left(\frac{1}{RfD_i} x \; K_w \; x \; IRA_a \right) + \left(\frac{1}{RfDo} x \; IRW_a \right) \right]} \qquad \textbf{(EQ40)}$$

where:

Parameter	Definition (units)	SO Input Value
GW_{SS}	risk-based chemical concentration in water (mg/L)	--
THQ	target hazard quotient (unitless)	0.1
RfD_i	inhalation reference dose (mg/kg-day)	CS [a]
RfD_o	oral reference dose (mg/kg-day)	CS [a]
BW_a	average adult body weight (kg)	70 [b]
AT_{nni}	averaging time - noncarcinogens, non-industrial (yr)	30 [b]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [b]
ED_{ni}	non-industrial exposure duration (yr)	30 [b]
IRW_a	adult water ingestion rate (L/day)	2 [b]
IRA_a	adult inhalation rate (m^3/day)	20 [b]
K_w	water-to-indoor air volatilization factor (L/m^3)	0.5 [c,d]

[a]Chemical-specific.
[b]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[c]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual Part B Development of Risk-Based Preliminary Remedial Goals*, EPA 1991.
[d]The water-air concentration relationship represented by the volatilization factor (K_w) is applicable only to chemicals with a Henry's Law Constant of greater than 1E-05 atm-m^3/mole and a molecular weight of less than 200 g/mole.

GW_{SS} - Carcinogenic Effects - Non-Volatile Constituents (mg/l):

$$\frac{TR \; x \; AT_c \; x \; 365 \; days/yr}{EF_{ni} \; x \; (SF_o \; x \; IRW_{adj})} \qquad \textbf{(EQ41)}$$

where:

Parameter	Definition (units)	SO Input Value
GW_{SS}	risk-based chemical concentration in water (mg/L)	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]
SF_o	oral cancer slope factor ((mg/kg-day)$^{-1}$)	CS [b]
AT_c	averaging time - carcinogens (yr)	70 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]
IRW_{adj}	age-adjusted water ingestion rate (L-yr/kg-day)	1.1 [a]

[a]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b]Chemical-specific.

GW_{SS} - Noncarcinogenic Effects - Non-Volatile Constituents (mg/l):

$$\frac{THQ x BW_a x AT_{nni} x 365 days/yr}{EF_{ni} x ED_{ni} x \left(1/RfD_o x IRW_a\right)} \qquad \textbf{(EQ42)}$$

where:

Parameter	Definition (units)	SO Input Value
GW_{SS}	risk-based chemical concentration in water (mg/L)	--
THQ	target hazard quotient (unitless)	0.1
RfD_o	oral reference dose (mg/kg-day)	CS [a]
BW_a	average adult body weight (kg)	70 [b]
AT_{nni}	averaging time - noncarcinogens, non-industrial (yr)	30 [b]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [b]
ED_{ni}	non-industrial exposure duration (yr)	30 [b]
IRW_a	adult water ingestion rate (L/day)	2 [b]

[a]Chemical-specific.
[b]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.

EQ39 through EQ42 were obtained from *Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003. A RECAP Standard shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the RS.

H2.2.2 Groundwater Classification 1 – Risk-based Standard (GW_1)

For constituents not listed in Table 3, the MCL shall serve as the GW_1. If an MCL is not available, then a risk-based GW_1 shall be calculated as follows:

GW_1 - Carcinogenic Effects - Volatile Constituents (mg/l):

$$\frac{TR\,x\,AT_c\,x\,365\ days/yr}{EF_{ni}\,x\,[(SF_i\,x\,K_w\,x\,IRA_{adj})+(SF_o\,x\,IRW_{adj})]} \qquad \textbf{(EQ39)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_1	risk-based chemical concentration in water (mg/L)	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]
SF_o	oral cancer slope factor ((mg/kg-day)$^{-1}$)	CS [b]	CS [b]	CS [b]
SF_i	inhalation cancer slope factor ((mg/kg-day)$^{-1}$)	CS [b]	CS [b]	CS [b]
AT_c	averaging time - carcinogens (yr)	70 [a]	70 [a]	70 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]
IRW_{adj}	age-adjusted water ingestion rate (L-yr/kg-day)	1.1 [a]	1.1 [a]	1.1 [a]
IRA_{adj}	age-adjusted inhalation rate (m^3-yr/kg-day)	11 [a]	11 [a]	11 [a]
K_w	water-to-indoor air volatilization factor (L/m^3)	0.5 [c,d]	0.5 [c,d]	0.5 [c,d]

[a] *Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b] Chemical-specific.
[c] *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual Part B Development of Risk-Based Preliminary Remedial Goals*, EPA 1991.
[d] The water-air concentration relationship represented by the volatilization factor (K_w) is applicable only to chemicals with a Henry's Law Constant of greater than 1E-05 atm-m^3/mole and a molecular weight of less than 200 g/mole.

GW_1 - Noncarcinogenic Effects - Volatile Constituents (mg/l):

$$\frac{THQ \, x \, BW_a \, x \, AT_{nni} \, x \, 365 \; days \, / \, yr}{EF_{ni} \, x \, ED_{ni} \, x \left[\left(\frac{1}{RfD_i} x \, K_w \, x \, IRA_a \right) + \left(\frac{1}{RfDo} x \; IRW_a \right) \right]} \qquad \textbf{(EQ40)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_1	risk-based chemical concentration in water (mg/L)	--	--	--
THQ	target hazard quotient (unitless)	1.0 [a]	1.0 [a]	1.0 [a]
RfD_i	inhalation reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]
RfD_o	oral reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]
AT_{nni}	averaging time - noncarcinogens, non-industrial (yr)	30 [a]	30 [a]	30 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]
ED_{ni}	non-industrial exposure duration (yr)	30 [a]	30 [a]	30 [a]
IRW_a	adult water ingestion rate (L/day)	2 [a]	2 [a]	2 [a]
IRA_a	adult inhalation rate (m^3/day)	20 [a]	20 [a]	20 [a]
K_w	water-to-indoor air volatilization factor (L/m^3)	0.5 [c,d]	0.5 [c,d]	0.5 [c,d]

[a]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b]Chemical-specific.
[c]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual Part B Development of Risk-Based Preliminary Remedial Goals*, EPA 1991.
[d]The water-air concentration relationship represented by the volatilization factor (K_w) is applicable only to chemicals with a Henry's Law Constant of greater than 1E-05 atm-m^3/mole and a molecular weight of less than 200 g/mole.

GW_1 - Carcinogenic Effects - Non-Volatile Constituents (mg/l):

$$\frac{TR \; x \; AT_c \; x \; 365 \; days/yr}{EF_{ni} \; x \; (SF_o \; x \; IRW_{adj})} \qquad \textbf{(EQ41)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_1	risk-based chemical concentration in water (mg/L)	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [b]	CS [b]	CS [b]
AT_c	averaging time - carcinogens (yr)	70 [a]	70 [a]	70 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]
IRW_{adj}	age-adjusted water ingestion rate (L-yr/kg-day)	1.1 [a]	1.1 [a]	1.1 [a]

[a]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b]Chemical-specific.

GW_1 - Noncarcinogenic Effects - Non-Volatile Constituents (mg/l):

$$\frac{THQ \; x \; BW_a \; x \; AT_{nni} \; x \; 365 \; days/yr}{EF_{ni} \; x \; ED_{ni} \; x \; \left(1/RfD_o \; x \; IRW_a\right)} \qquad \textbf{(EQ42)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_1	risk-based chemical concentration in water (mg/L)	--	--	--
THQ	target hazard quotient (unitless)	1.0 [a]	1.0 [a]	1.0 [a]
RfD_o	oral reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]
AT_{nni}	averaging time - noncarcinogens, non-industrial (yr)	30 [a]	30 [a]	30 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]
ED_{ni}	non-industrial exposure duration (yr)	30 [a]	30 [a]	30 [a]
IRW_a	adult water ingestion rate (L/day)	2 [a]	2 [a]	2 [a]

[a]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b]Chemical-specific.

H2.2.3 Groundwater Classification 2 – Risk-based Standard (GW_2)

For constituents not listed in Table 3, the MCL shall serve as the GW_2. If an MCL is not available, then a risk-based GW_2 shall be calculated as follows:

(1) Calculate a GW_2 using EQ39, EQ40, EQ41, or EQ42;

GW_2 - Carcinogenic Effects - Volatile Constituents (mg/l):

$$\frac{TR\,x\,AT_c\,x\,365 days/yr}{EF_{ni}\,x[(SF_i\,x\,K_w\,x\,IRA_{adj})+(SF_o\,x\,IRW_{adj})]} \qquad \textbf{(EQ39)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_2	risk-based chemical concentration in water (mg/L)	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]
SF_o	oral cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [b]	CS [b]	CS [b]
SF_i	inhalation cancer slope factor ($(mg/kg\text{-}day)^{-1}$)	CS [b]	CS [b]	CS [b]
AT_c	averaging time - carcinogens (yr)	70 [a]	70 [a]	70 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]
IRW_{adj}	age-adjusted water ingestion rate (L-yr/kg-day)	1.1 [a]	1.1 [a]	1.1 [a]
IRA_{adj}	age-adjusted inhalation rate (m^3-yr/kg-day)	11 [a]	11 [a]	11 [a]
K_w	water-to-indoor air volatilization factor (L/m^3)	0.5 [c,d]	0.5 [c,d]	0.5 [c,d]

[a] *Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b] Chemical-specific.
[c] *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual Part B Development of Risk-Based Preliminary Remedial Goals*, EPA 1991.
[d] The water-air concentration relationship represented by the volatilization factor (K_w) is applicable only to chemicals with a Henry's Law Constant of greater than 1E-05 atm-m^3/mole and a molecular weight of less than 200 g/mole.

GW_2 - Noncarcinogenic Effects - Volatile Constituents (mg/l):

$$\frac{THQ\;x\;BW_a\;x\;AT_{nni}\;x\;365\;days\,/\,yr}{EF_{ni}\;x\;ED_{ni}\;x\left[\left(\frac{1}{RfD_i}\;x\;K_w\;x\;IRA_a\right)+\left(\frac{1}{RfDo}\;x\;IRW_a\right)\right]} \quad \textbf{(EQ40)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	MO-2	MO-3
GW_2	risk-based chemical concentration in water (mg/L)	--	--	--
THQ	target hazard quotient (unitless)	1.0 [a]	1.0 [a]	1.0 [a]
RfD_i	inhalation reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]
RfD_o	oral reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]
AT_{nni}	averaging time - noncarcinogens, non-industrial (yr)	30 [a]	30 [a]	30 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]
ED_{ni}	non-industrial exposure duration (yr)	30 [a]	30 [a]	30 [a]
IRW_a	adult water ingestion rate (L/day)	2 [a]	2 [a]	2 [a]
IRA_a	adult inhalation rate (m^3/day)	20 [a]	20 [a]	20 [a]
K_w	water-to-indoor air volatilization factor (L/m^3)	0.5 [c,d]	0.5 [c,d]	0.5 [c,d]

[a]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b]Chemical-specific.
[c]*Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual Part B Development of Risk-Based Preliminary Remedial Goals*, EPA 1991.
[d]The water-air concentration relationship represented by the volatilization factor (K_w) is applicable only to chemicals with a Henry's Law Constant of greater than 1E-05 atm-m^3/mole and a molecular weight of less than 200 g/mole.

GW_2 - Carcinogenic Effects - Non-Volatile Constituents (mg/l):

$$\frac{TR\ x\ AT_c\ x\,365\ days\,/\,yr}{EF_{ni}\ x\ \left(SF_o\ x\ IRW_{adj}\right)} \qquad \textbf{(EQ41)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_2	risk-based chemical concentration in water (mg/L)	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]
SF_o	oral cancer slope factor ((mg/kg-day)$^{-1}$)	CS [b]	CS [b]	CS [b]
AT_c	averaging time - carcinogens (yr)	70 [a]	70 [a]	70 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]
IRW_{adj}	age-adjusted water ingestion rate (L-yr/kg-day)	1.1 [a]	1.1 [a]	1.1 [a]

[a]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b]Chemical-specific.

GW_2 - Noncarcinogenic Effects - Non-Volatile Constituents (mg/l):

$$\frac{THQxBW_a\,xAT_{nni}\,x365days\,/\,yr}{EF_{ni}\,xED_{ni}\,x\left(1\,/\,RfD_o\,xIRW_a\right)} \qquad \textbf{(EQ42)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_2	risk-based chemical concentration in water (mg/L)	--	--	--
THQ	target hazard quotient (unitless)	1.0 [a]	1.0 [a]	1.0 [a]
RfD_o	oral reference dose (mg/kg-day)	CS [b]	CS [b]	CS [b]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]
AT_{nni}	averaging time - noncarcinogens, non-industrial (yr)	30 [a]	30 [a]	30 [a]
EF_{ni}	non-industrial exposure frequency (days/yr)	350 [a]	350 [a]	350 [a]
ED_{ni}	non-industrial exposure duration (yr)	30 [a]	30 [a]	30 [a]
IRW_a	adult water ingestion rate (L/day)	2 [a]	2 [a]	2 [a]

[a]*Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.
[b]Chemical-specific.

IRW_{adj} for EQ41, EQ42, EQ43, and EQ44 (L-yr/kg-day):

$$\frac{IRW_c \ x \ ED_c}{BW_c} + \frac{IRW_a \ x \ ED_a}{BW_a} \qquad \textbf{(EQ43)}$$

where:

Parameter	Definition (units)	Input Value
IRW_{adj}	age-adjusted water ingestion rate (L-yr/kg-day)	1.1
IRW_c	child average water ingestion rate ages 1-6 (L/day)	1
ED_c	child exposure duration ages 1-6 (yr)	6
BW_c	average child body weight ages 1-6 (kg)	15
IRW_a	adult average water ingestion rate ages 7-31 (L/day)	2
ED_a	adult exposure duration ages 7-31 (yr)	24
BW_a	average adult body weight ages 7-31 (kg)	70

The IRW_{adj} equation and default parameters were obtained from *Human Health Medium-Specific Screening Levels,* EPA Region VI, 2003.

(2) Under MO-1, the GW_2 shall be multiplied by a DF2 in accordance with Section H1.2.2.2. Under MO-2, a site-specific longitudinal dilution and attenuation factor (DAF2) shall be calculated using the Domenico model (EQ65) and site-specific data and/or default parameters (refer to Section H2.5) and applied to the GW_2 in accordance with Section H1.2.3.2. Under MO-3, a site-specific longitudinal dilution and attenuation factor (DAF2) shall be calculated using the Domenico model or other appropriate model approved by the Department and site-specific data and/or default parameters. Note: The DF2 or the site-specific DAF2 shall be representative of dilution and attenuation of the COC concentration associated with groundwater migration to the nearest downgradient property boundary.

H2.2.4 Groundwater Classification 3 (GW_3)

For constituents not listed in Table 3, refer to Table 1 of LAC 33:IX.1113. For constituents not listed in Table 1 of LAC 33:IX.1113, a GW_3 shall be calculated based on the classification of the nearest surface water body downgradient of the groundwater AOI as follows:

(1) Calculate a GW_3 using EQ44, EQ47, EQ48, or EQ49;

Protection of Surface Water Classified as a Non-Drinking Water Supply:

The State human health protection non-drinking water supply criterion in LAC 33:IX.1113, Table 1 shall be used as the GW_{3NDW}. If a State human health protection non-drinking water supply criterion for a COC does not exist, then compare: (1) the risk-based criterion developed using the equations presented below (a GW_{3NDW} protective of carcinogenic effects and a GW_{3NDW} protective of noncarcinogenic effects shall be calculated and the more protective criterion shall be used as the human health non-drinking water supply criterion); (2) the MCL; and (3) the State human health protection drinking water supply criterion and select the highest of these three values as the GW_{3NDW}. Note: No substitutions shall be made for the input values presented below for the calculation of the GW_{3NDW}. A GW_{3NDW} RS shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the RS. EQ44 and EQ47 were obtained from *Human Health Numerical Criteria Derivations for Toxic Substances*, LDEQ, Office of Water Resources, June 23, 1994. For the generation of Table 3, the State human health protection non-drinking water supply criterion was identified in LAC 33:IX.1113, Table 1; if a criterion was not available, then (1) a GW_{3NDW} was determined for both carcinogenic and noncarcinogenic effects and the lower of the two values was identified as the GW_{3NDW}; (2) the MCL was identified; and (3) the State human health protection drinking water supply criterion was identified in LAC 33:IX.1113, Table 1 and the highest of the three values was listed as the GW_{3NDW}.

GW_{3NDW} - Protection of Surface Water Classified as a Non-Drinking Water Supply - Carcinogenic Effects (mg/l):

$$\frac{TR \times BW_a}{SF_o[IRW_{NDW} + (BCF \times IRF)]} \qquad \textbf{(EQ44)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_{3NDW}	risk-based constituent concentration in water (mg/l)	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]
IRF	fish/shellfish ingestion rate (kg/day)	0.02 [a]	0.02 [a]	0.02 [b]
SF_o	oral cancer slope factor ($(\text{mg/kg-day})^{-1}$)	CS [c]	CS [c,d]	CS [c,d]
IRW_{NDW}	incidental water ingestion rate (L/day)	0.089 [a,e]	0.089 [a,e]	0.089 [a,e]
BCF	bioconcentration factor (L/kg)	CS [c,f]	CS [c,f]	CS [c,f]

[a]*Human Health Criteria Derivations for Toxic Substances,* LDEQ 1994.

[b]An fish ingestion rate of 0.02 kg/day shall be used in accordance with the calculation of Louisiana Water Quality Standards for water bodies designated for primary contact recreation. For water bodies designated as classification B secondary contact recreation and limited aquatic and wildlife use, a fish ingestion rate of 0.0065 kg/day shall be used.

[c]Chemical-specific; if the COC is listed in Tables 1-3, the chemical-specific data presented in the worksheets at the end of this Appendix shall be used under MO-2 and MO-3; if the COC is not listed in Tables 1-3, the Submitter shall follow the hierarchy of references listed at the end of this Appendix for the collection of chemical-specific data.

[d]For the calculation of a GW_{3NDW} for PCB, the equation presented above will have to be modified to include a SF for water ingestion and SF for fish ingestion. A RECAP Standard shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the risk-based RS.

[e]An incidental ingestion rate of 0.089 L/day shall be used in accordance with the calculation of Louisiana Water Quality Standards for water bodies designated for primary contact recreation. This rate is based on the following assumptions: 250 mL/hr possible ingestion X 5 hrs/week swimming duration X 6 months/12 months swimming season X 1 week/7 days = 0.089 L/day incidental ingestion. For water bodies designated as classification B secondary contact recreation and limited aquatic and wildlife use, an incidential water ingestion rate of 0 L/day shall be used.

[f] If there is potential for a COC to be bioconcentrated by fish and a BCF value is not available for the COC, then a BCF may be estimated using the K_{ow} and EQ45 (and/or EQ46) presented below or using another appropriate model approved by the Department.

$$\log BCF = 0.76 \log K_{ow} - 0.23 \qquad \textbf{(EQ45)}$$

where:

Parameter	Definition	Input Value
BCF	Bioconcentration factor (L/kg)	chemical-specific
K_{ow}	Octanol-water partition coefficient	chemical-specific

(EQ45: Fundamentals of Aquatic Toxicology. 1985. Ed. Rand and S. Petrocelli, Washington: Hemisphere Publishing Corp., Chapter 17, Bioaccumulation, A. Ipacie and J. L. Hamelink)

If a K_{ow} is not available in the literature, a K_{ow} value may be estimated from the K_{oc} using the equation presented below (or other appropriate model):

$\text{Log } K_{oc} = 0.0784 + (0.7919 \text{ x } \log K_{ow})$ **(EQ46)**

(EQ46: *Soil Screening Guidance: Technical Background Document*, EPA, 1996).

GW_{3NDW} - Protection of a Surface Water Classified as a Non-Drinking Water Supply - Noncarcinogenic Effects (mg/l):

$$\frac{THQ \times RfD_o \times BW_a}{IRW_{NDW} + (BCF \times IRF)} \qquad \textbf{(EQ47)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_{3NDW}	risk-based constituent concentration in water (mg/l)	--	--	--
THQ	target hazard quotient (unitless)	1.0 [a]	1.0 [a]	1.0 [a]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]
IRF	fish/shellfish ingestion rate (kg/day)	0.02 [a]	0.02 [a]	0.02 [a,b]
RfD_o	oral reference dose (mg/kg-day)	CS [c]	CS [c,d]	CS [c,d]
IRW_{NDW}	incidental water ingestion rate (L/day)	0.089 [a,e]	0.089 [a,e]	0.089 [a,e]
BCF	bioconcentration factor (L/kg)	CS [c,f]	CS [c,f]	CS [c,f]

[a] *Human Health Numerical Criteria Derivations for Toxic Substances*, LDEQ 1994.

[b] An fish ingestion rate of 0.02 kg/day shall be used in accordance with the calculation of Louisiana Water Quality Standards for water bodies designated for primary contact recreation. For water bodies designated as classification B secondary contact recreation and limited aquatic and wildlife use, a fish ingestion rate of 0.0065 kg/day shall be used.

[c] Chemical-specific; if the COC is listed in Tables 1-3, the chemical-specific data presented in the worksheets at the end of this Appendix shall be used under MO-2 and MO-3; if the COC is not listed in Tables 1-3, the Submitter the hierarchy pf references presented at the end of this Appendix for the collection of chemical-specific data.

[d] For the calculation of a GW_{3NDW} for PCB, the equation presented above will have to be modified to include a SF for water ingestion and SF for fish ingestion. A RECAP Standard shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the risk-based RS.

[e] An incidental ingestion rate of 0.089 L/day shall be used in accordance with the calculation of Louisiana Water Quality Standards for water bodies designated for primary contact recreation. This rate is based on the following assumptions: 250 mL/hr possible ingestion X 5 hrs/week swimming duration X 6 months/12 months swimming season X 1 week/7 days = 0.089 L/day incidental ingestion. For water bodies designated as classification B secondary contact recreation and limited aquatic and wildlife use, an incidential water ingestion rate of 0 L/day shall be used.

[f] If there is potential for a COC to be bioconcentrated by fish and a BCF value is not available for the COC, then a BCF may be estimated using the K_{ow} and EQ45 and/or EQ46 or another appropriate model approved by the Department.

Protection of Surface Water Classified as a Drinking Water Supply:

The State human health protection drinking water supply criterion in LAC 33:IX.1113, Table 1 shall be used as the GW_{3DW}. If a State human health protection drinking water supply criterion is not available, then the MCL shall be used. If an MCL is not available for a COC, then a risk-based criterion shall be developed using the equation presented below. A GW_{3DW} protective of carcinogenic effects and a GW_{3DW} protective of noncarcinogenic effects shall be calculated and the lower of the two values shall be used as the human health drinking water supply criterion. Note: No substitutions shall be made for the input values presented below for the calculation of the GW_{3DW}. A GW_{3DW} RS shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the RS. EQ48 and EQ49 were obtained from *Human Health Numerical Criteria Derivations for Toxic Substances*, LDEQ, Office of Water Resources, June 23, 1994. For the generation of Table 3, the State human health protection drinking water supply criterion was identified in LAC 33:IX.1113, Table 1; if a criterion was not available, the MCL was identified as the GW_{3DW}; if an MCL was not available, a GW_{3DW} was determined for both carcinogenic and noncarcinogenic effects and the lower of the two values was identified as the GW_{3DW}.

GW_{3DW} - Protection of a Surface Water Classified as a Drinking Water Supply - Carcinogenic Effects (mg/l):

$$\frac{TR x BW_a}{SF_o x\left[IRW_a + IRW_{NDW} + \left(BCFxIRF\right)\right]} \qquad \textbf{(EQ48)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_{3DW}	risk-based constituent concentration in water (mg/l)	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	10^{-6} [a]	10^{-6} [a]	10^{-6} [a]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]
IRF	fish/shellfish ingestion rate (kg/day)	0.02 [a]	0.02 [a]	0.02 [a]
SF_o	oral cancer slope factor ((mg/kg-day)$^{-1}$)	CS [b]	CS [b,c]	CS [b,c]
IRW_a	adult water ingestion rate (L/day)	2 [a]	2 [a]	2 [a]
IRW_{NDW}	incidental water ingestion rate (L/day)	0.089 [a,d]	0.089 [a,d]	0.089 [a,d]
BCF	bioconcentration factor (L/kg)	CS [b,e]	CS [b,e]	CS [b,e]

[a] *Human Health Numerical Criteria Derivations for Toxic Substances*, LDEQ 1994.

[b] Chemical-specific; if the COC is listed in Tables 1-3, the chemical-specific data presented in the worksheets at the end of this Appendix shall be used under MO-2 and MO-3; if the COC is not listed in Tables 1-3, the Submitter shall establish an hierarchy for the collection of chemical-specific data.

[c] For the calculation of a GW_{3DW} for PCBs, the equation presented above will have to be modified to include a SF for water ingestion and slope factor for fish ingestion. A RECAP Standard shall be

determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the risk-based RS.

[d]An incidental ingestion rate of 0.089 L/day shall be used in accordance with the calculation of Louisiana Water Quality Standards for water bodies designated for primary contact recreation. This rate is based on the following assumptions: 250 mL/hr possible ingestion X 5 hrs/week swimming duration X 6 months/12 months swimming season X 1 week/7 days = 0.089 L/day incidental ingestion.

[e]If there is potential for a COC to be bioconcentrated by fish and a BCF value is not available for the COC, then a BCF may be estimated using the K_{ow} and EQ45 and/or EQ46 or another appropriate model approved by the Department.

GW_{3DW} - Protection of Surface Water Classified as a Drinking Water Supply - Noncarcinogenic Effects (mg/l):

$$\frac{THQ x RfD_o x BW_a}{IRW_a + IRW_{NDW} + (BCF x IRF)} \quad \textbf{(EQ49)}$$

where:

Parameter	Definition (units)	Input Value		
		MO-1	**MO-2**	**MO-3**
GW_{3DW}	risk-based constituent concentration in water (mg/l)	--	--	--
THQ	target hazard quotient (unitless)	1.0 [a]	1.0 [a]	1.0 [a]
BW_a	average adult body weight (kg)	70 [a]	70 [a]	70 [a]
IRF	fish/shellfish ingestion rate (kg/day)	0.02 [a]	0.02 [a]	0.02 [a]
RfD_o	oral reference dose (mg/kg-day)	CS [b]	CS [b,c]	CS [b,c]
IRW_a	adult water ingestion rate (L/day)	2 [a]	2 [a]	2 [a]
IRW_{NDW}	incidental water ingestion rate (L/day)	0.089 [a,d]	0.089 [a,d]	0.089 [a,d]
BCF	bioconcentration factor (L/kg)	CS [b,e]	CS [b,e]	CS [b,e]

[a]*Human Health Numerical Criteria Derivations for Toxic Substances*, LDEQ 1994.

[b]Chemical-specific; if the COC is listed in Tables 1-3, the chemical-specific data presented in the worksheets at the end of this Appendix shall be used under MO-2 and MO-3; if the COC is not listed in Tables 1-3, the Submitter shall establish an hierarchy for the collection of chemcial-specific data.

[c]For the calculation of a GW_{3DW} for PCBs, the equation presented above will have to be modified to include a SF for water ingestion and slope factor for fish ingestion. A RECAP Standard shall be determined for both carcinogenic and noncarcinogenic effects and the more protective value shall be used as the risk-based RS.

[d]An incidental ingestion rate of 0.089 L/day shall be used in accordance with the calculation of Louisiana Water Quality Standards for water bodies designated for primary contact recreation. This rate is based on the following assumptions: 250 mL/hr possible ingestion X 5 hrs/week swimming duration X 6 months/12 months swimming season X 1 week/7 days = 0.089 L/day incidental ingestion.

[e]If there is potential for a COC to be bioconcentrated by fish and a BCF value is not available for the COC, then a BCF may be estimated using the K_{ow} and EQ45 and/or EQ46 or another appropriate model approved by the Department.

(2) Under MO-1, the GW_3 shall be multiplied by a DF3 in accordance with Section H1.1.2.1. Under MO-2, a site-specific longitudinal dilution and attenuation factor (DAF3) shall be calculated using the Domenico model (EQ65) and site-specific data and/or default parameters and applied to the GW_3 in accordance with Section H1.1.3.1. Under MO-3, a site-specific longitudinal dilution and attenuation factor (DAF3) shall be calculated using the Domenico model or other appropriate model approved by the Department and site-specific data and/or default parameters. Note: The DF3 or the site-specific DAF3 shall be representative of dilution and attenuation of the COC concentration associated with groundwater migration to the nearest downgradient surface water body.

H2.2.5 Volatile Emissions from Groundwater to an Enclosed Structure Pathway (GW_{es})

GW_{es} (mg/l):

$$\frac{C_a\left[\frac{\mu g}{m^3 - air}\right]}{VF_{GWes}} x10^{-3}\,\frac{mg}{\mu g} \qquad \textbf{(EQ50)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	**MO-1**	**MO-2**	**MO-3**
GW_{es}	risk-based chemical concentration in groundwater for enclosed structure (indoor) vapor inhalation (mg/l)	NA [a]	--	--	--
C_a	risk-based chemical concentration in air for enclosed-structure (indoor) vapor inhalation ($\mu g/m^3$)	NA [a]	refer to Section H2.3	refer to Section H2.3	refer to Section H2.3
VF_{GWes}	groundwater to enclosed-structure vapor volatilization factor ($mg/m^3/mg/l$)	NA [a]	EQ51-EQ52 [b]	EQ51 - EQ52 [b]	EQ51 - EQ52 [b]

[a]Not Applicable to this Option.
[b]Refer to EQ51 for non-industrial land use and EQ52 for industrial land use.

VF_{GWesni} – Non-industrial Scenario (mg/m³/mg/L):

$$\frac{H'\left[\dfrac{D_{ws}/L_{GW}}{ER_{ni}\,xL_{Bni}}\right]}{1+\left[\dfrac{D_{ws}/L_{GW}}{ER_{ni}\,xL_{Bni}}\right]+\left[\dfrac{D_{ws}/L_{GW}}{(D_{crack}/L_{crack})FC}\right]}x10^{3}\ \frac{L}{m^{3}} \qquad \textbf{(EQ51)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
VF_{GWesni}	groundwater to enclosed-structure vapor volatilization factor for a non-industrial scenario (mg/m³/mg/l)	NA [a]	--	--	--
H'	Henry's Law Constant (dimensionless)	NA [a]	CS [b,c]	CS [b,c]	CS [b,c]
D_{ws}	effective diffusion coefficient between groundwater and soil surface (cm²/s)	NA [a]	CS [b]	SS [d]	SS [d]
L_{GW}	depth to groundwater (cm)	NA [a]	300	SS [e]	SS [e]
ER_{ni}	non-industrial enclosed-structure air exchange rate (1/s)	NA [a]	0.00014	SS [e] (0.00014)	SS [e] (0.00014)
L_{Bni}	non-industrial enclosed-structure volume/infiltration area ratio (cm)	NA [a]	200	SS [e] (200)	SS [e] (200)
FC	areal fraction of cracks in foundation/walls (cm²cracks/cm² total area)	NA [a]	0.01	SS [e] (0.01)	SS [e] (0.01)
L_{crack}	enclosed-structure foundation or wall thickness (cm)	NA [a]	15	SS [e] (15)	SS [e] (15)
D_{crack}	effective diffusion coefficient through foundation cracks (cm²/s)	NA [a]	CS [b]	SS [f]	SS [f]

[a]Not Applicable to this Option.
[b]Chemical-specific.
[c]H' = H x 41 where: H = Henry's Law Constant (atm-m³/mol); R = Universal Law Constant (0.0000821 atm-m³/mole-°K); and T = Absolute temperature of soil (°K) [273 + °C (25°C)].
[d]Refer to EQ53.
[e]Site-specific; a default value demonstrated to be representative of site conditions may be used in the Johnson and Ettinger model if approved by the Department. Department approval for the use of an alternate default value shall be obtained prior to calculation of the GW_{es} RS.
[f] Site-specific; refer to EQ30.

VF_{GWesi} – Industrial Scenario (mg/m^3/mg/L):

$$\frac{H'\left[\dfrac{D_{ws}/L_{GW}}{ER_i x L_{Bi}}\right]}{1+\left[\dfrac{D_{ws}/L_{GW}}{ER_i x L_{Bi}}\right]+\left[\dfrac{D_{ws}/L_{GW}}{(D_{crack}/L_{crack})FC}\right]} x10^3\ \frac{L}{m^3} \qquad \textbf{(EQ52)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
VF_{GWesi}	groundwater to enclosed-structure vapor volatilization factor for an industrial scenario (mg/m^3/mg/l)	NA [a]	--	--	--
H'	Henry's Law Constant (dimensionless)	NA [a]	CS [b]	CS [b]	CS [b]
D_{ws}	effective diffusion coefficient between groundwater and soil surface (cm^2/s)	NA [a]	CS [b]	SS [c]	SS [c]
L_{GW}	depth to groundwater (cm)	NA [a]	300	SS [d]	SS [d]
ER_i	industrial enclosed-structure air exchange rate (1/s)	NA [a]	0.00023	SS [d] (0.00023)	SS [d] (0.00023)
L_{Bi}	industrial enclosed-structure volume/infiltration area ratio (cm)	NA [a]	300	SS [d] (300)	SS [d] (300)
FC	areal fraction of cracks in foundation/walls (cm^{2}cracks/cm^2 total area)	NA [a]	0.01	SS [d] (0.01)	SS [d] (0.01)
L_{crack}	enclosed-structure foundation or wall thickness (cm)	NA [a]	15	SS [d] (15)	SS [d] (15)
D_{crack}	effective diffusion coefficient through foundation cracks (cm^2/s)	NA [a]	CS [b]	SS [e]	SS [e]

[a]Not Applicable to this Option.
[b]Chemical-specific; H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^{o}K); and T = Absolute temperature of soil (^{o}K) [273 + ^{o}C (25^{o}C)].
[c]Site-specific; refer to EQ53.
[d]Site-specific; a default value demonstrated to be representative of site conditions may be used in the Johnson and Ettinger model if approved by the Department. Department approval for the use of an alternate default value shall be obtained prior to calculation of the GW_{es} RS.
[e]Site-specific; refer to EQ30.

D_{ws} (cm^2/s):

$$D_{ws}\left[\frac{cm^2}{s}\right] = (h_{cap} + h_v)\left[\frac{h_{cap}}{D_{cap}} + \frac{h_v}{D_s}\right]^{-1} \qquad \textbf{(EQ53)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	**MO-1**	**MO-2**	**MO-3**
D_{ws}	effective diffusion coefficient between groundwater and soil surface (cm^2/s)	NA [a]	--	--	--
h_{cap}	thickness of capillary fringe (cm)	NA [a]	5	SS [b] (5)	SS [b] (5)
h_v	thickness of vadose zone (cm)	NA [a]	295	SS [b] (295)	SS [b] (295)
D_{cap}	effective diffusion coefficient through capillary fringe (cm^2/s)	NA [a]	CS [c]	SS [d]	SS [d]
D_s	effective diffusion coefficient in soil based on vapor-phase concentration (cm^2/s)	NA [a]	CS [c]	SS [e]	SS [e]

[a]Not Applicable to this Option.
[b]Site-specific; a default value demonstrated to be representative of site conditions may be used in the Johnson and Ettinger model if approved by the Department. Department approval for the use of an alternate default value shall be obtained prior to calculation of the GW_{es} RS.
[c]Chemical-specific.
[d]Site-specific; refer to EQ54.
[e]Site-specific; refer to EQ29.

D_{cap} (cm^2/s):

$$D_{air}\frac{\theta_{acap}^{3.33}}{n^2}+D_{wat}\frac{1}{H'}\frac{\theta_{wcap}^{3.33}}{n^2} \qquad \textbf{(EQ54)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	**MO-1**	**MO-2**	**MO-3**
D_{cap}	effective diffusion coefficient through capillary fringe (cm^2/s)	NA [a]	--	--	--
D_{air}	diffusion coefficient in air (cm^2/s)	NA [a]	CS [b]	CS [b]	CS [b]
θ_{acap}	volumetric air content in capillary fringe soils (cm^3-air/cm^3soil)	NA [a]	n-θ_{wcap} (0.015)	SS [c] n-θ_{wcap} (0.015)	SS [c] n-θ_{wcap} (0.015)
n	total soil porosity (L_{pore}/L_{soil})	NA [a]	$(1-\rho_b/\rho_s)$	$(1-\rho_b/\rho_s)$	$(1-\rho_b/\rho_s)$
θ_{wcap}	volumetric water content in capillary fringe soils (cm^3-H_2O/cm^3-soil)	NA [a]	0.345 [d]	SS [c] (0.345) [d]	SS [c] (0.345) [d]
D_{wat}	diffusion coefficient in water (cm^2/s)	NA [a]	CS [b]	CS [b]	CS [b]
ρ_b	dry soil bulk density (g/cm^3)	NA [a]	1.7 [d]	SS [c] (1.7) [d]	SS [c] (1.7) [d]
ρ_s	soil particle density (g/cm^3)	NA [a]	2.65 [d]	SS [c] (2.65) [d]	SS [c] (2.65) [d]
H′	Henry's Law Constant (dimensionless)	NA [a]	CS [b,e]	CS [b,e]	CS [b,e]

[a]Not Applicable to this Option.
[b]Chemical-specific.
[c]Site-specific; a default value demonstrated to be representative of site conditions may be used in the Johnson and Ettinger model if approved by the Department. Department approval for the use of an alternate default value shall be obtained prior to calculation of the GW_{es} RS.
[d]LDEQ
[e]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^{o}K); and T = Absolute temperature of soil (^{o}K) [273 + ^{o}C (25^{o}C)].

EQ29, EQ30, EQ50, EQ51, EQ52, EQ53, and EQ54 were obtained from *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*, ASTM E-1739 with the exception of the default input values footnoted LDEQ. Additional information on the Johnson and Ettinger Model is available in *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (EPA November 2002).

H2.2.6 Volatile Emissions from Groundwater to Ambient Air Pathway (GW_{air})

GW_{air} (mg/l):

$$\frac{C_a\left[\frac{\mu g}{m^3 - air}\right]}{VF_{GW_{air}}} x10^{-3} \frac{mg}{\mu g} \qquad \textbf{(EQ55)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	MO-1	MO-2	MO-3
GW_{air}	risk-based chemical concentration in groundwater for ambient air (outdoor) vapor inhalation (mg/l)	NA [a]	--	--	--
C_a	risk-based chemical concentration in air for ambient air (outdoor) vapor inhalation ($\mu g/m^3$)	NA [a]	refer to Section H2.3	refer to Section H2.3	refer to Section H2.3
VF_{GWair}	groundwater to ambient air vapor volatilization factor ($mg/m^3/mg/l$)	NA [a]	EQ56	EQ56	EQ56

[a]Not Applicable for this Option.

VF_{Gwair} ($mg/m^3/mg/L$):

$$\frac{H'}{1+\left[\frac{U_{air}\delta_{air}L_{GW}}{WD_{ws}}\right]} x10^3 \frac{L}{m^3} \qquad \textbf{(EQ56)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)			
		SO	MO-1	MO-2	MO-3
VF_{GWair}	groundwater to ambient air vapor volatilization factor ($mg/m^3/mg/l$)	NA [a]	--	--	--
H′	Henry's Law Constant (dimensionless)	NA [a]	CS [b,c]	CS [b,c]	CS [b,c]
D_{ws}	effective diffusion coefficient between groundwater and soil surface (cm^2/s)	NA [a]	CS [b]	SS [d]	SS [d]
L_{GW}	depth to groundwater (cm)	NA [a]	300	SS [e]	SS [e]
U_{air}	wind speed above ground surface in ambient mixing zone (cm/s)	NA [a]	225	SS [e] (225)	SS [e] (225)
W	width of source area parallel to wind (cm)	NA [a]	4511	SS [e]	SS [e]
δ_{air}	ambient air mixing zone height (cm)	NA [a]	200	SS [e] (200)	SS [e] (200)

[a]Not Applicable for this Option.
[b]Chemical-specific.
[c]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^{o}K); and T = Absolute temperature of soil (^{o}K) [273 + ^{o}C (25^{o}C)].
[d]Site-specific; refer to EQ53.
[e]Site-specific.

H2.2.7 Water Solubility

The water solubility ($Water_{sol}$) shall be considered in the identification of the limiting groundwater RS for Groundwater Classifications 1, 2, and 3. The $Water_{sol}$ shall be identified in Table 3 of the text. If a COC is not listed in Table 3, a $Water_{sol}$ value shall be identified from an appropriate reference. A $Water_{sol}$ value used as a RS is subject to Department approval.

H2.3 Risk-Based Constituent Concentration in Air (C_a) for GW_{es}, GW_{air}, and $Soil_{es}$

MO-1 and MO-2: Identify the C_a in Table H-5. If a COC is not listed in Table H-5, refer to the Louisiana Toxic Air Pollutant Ambient Air Standards in Table 51.2 of LAC 33:III.5112. If the COC is a noncarcinogen, identify the 8-hour average ambient air standard as the C_a. If the COC is a carcinogen, identify the annual average ambient air standard as the C_a. If a COC is not listed in Table 51.2, a risk-based C_a for the appropriate land use shall be calculated using EQ57, EQ58, EQ59, or EQ60 (C_a shall not be calculated using the methods for standard development under LAC 33:III.5112). If multiple COC are present, the C_a shall be adjusted to account for additive health effects as warranted based on site-specific conditions.

MO-3: The C_a shall be based on: (1) the C_a in Table H-5: if a COC is not listed in Table H-5, refer to the Louisiana Toxic Air Pollutant Ambient Air Standards in Table 51.2 of LAC 33:III.5112; if the COC is a noncarcinogen, identify the 8-hour average ambient air standard as the C_a; if the COC is a carcinogen, identify the annual average ambient air satandard as the C_a; (2) a risk-based value calculated using EQ57, EQ58, EQ59, or EQ60 and default exposure assumptions for the appropriate land use scenario (a risk-based C_a shall not be calculated using the methods for standard development under LAC 33:III.5112); (3) a risk-based value calculated using EQ57, EQ58, EQ59, or EQ60 based on site-specific exposure data (a C_a shall not be calculated using the methods for standard development under LAC 33:III.5112); or (4) other risk-based value determined to be acceptable for site-specific conditions and approved by the Department. If multiple COC are present, the C_a shall be adjusted to account for additive health effects as warranted based on site-specific conditions.

If a C_a is below the analytical quantitation limit, then the analytical quantitation limit shall be identified as the C_a. The analytical quantitation limit identified for application as a C_a shall be the lowest quantitation limit available by routine analysis and shall be approved by the Department prior to use.

If the C_a is below a Department-approved (refer to Section 2.13) background concentration, the background concentration shall be shall be identified as the C_a.

For a non-detect result, the SQL shall be compared to C_a to document that the SQL is less than or equal to the C_a prior to eliminating the constituent from further evaluation under the RECAP.

If a calculated vapor concentration (C_a) exceeds the maximum theoretical vapor concentration, then the maximum theoretical vapor concentration shall be used as the C_a for the calculation of the $Soil_{es}$ (EQ26), GW_{es} (EQ50), and GW_{air} RS (EQ55). The maximum theoretical vapor concentration is subject to Department approval.

Risk-based C_a for Non-Industrial Land Use (C_{ani})

C_{ani} – Carcinogenic Effects (ug/m^3):

$$\frac{TR x AT_c x 365 \frac{days}{year} x 10^3 \mu g/mg}{EF_{ni} x SF_i x IRA_{adj}} \qquad \textbf{(EQ57)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	MO-1	MO-2	MO-3
C_{ani}	non-industrial risk-based chemical concentration in air for enclosed structure (indoor) vapor inhalation (μg/m^3)	NA [a]	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	NA [a]	10^{-6}	10^{-6}	10^{-6} [b]
SF_i	inhalation cancer slope factor (mg/kg-day)$^{-1}$	NA [a]	CS [c]	CS [c]	CS [c]
AT_c	averaging time - carcinogens (year)	NA [a]	70	70	70
EF_{ni}	non-industrial exposure frequency (days/year)	NA [a]	350	350	350
IRA_{adj}	age-adjusted inhalation rate (m^3-yr/kg-d)	NA [a]	11	11	11

[a]Not Applicable.
[b]Refer to Section 2.14.3.
[c]Chemical-specific.

C_{ani} - Noncarcinogenic Effects (ug/m^3):

$$\frac{THQ x RfD_i x BW_a x AT_{nni} x 365 \frac{days}{year} x 10^3 \frac{\mu g}{mg}}{IRA_a x EF_{ni} x ED_{ni}} \qquad \textbf{(EQ58)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	MO-1	MO-2	MO-3
C_{ani}	non-industrial risk-based chemical concentration in air for enclosed structure (indoor) vapor inhalation (μg/m^3)	NA [a]	--	--	--
THQ	target hazard quotient (unitless)	NA [a]	1.0	1.0	1.0
RfD_i	inhalation reference dose (mg/kg-day)	NA [a]	CS [b]	CS [b]	CS [b]
BW_a	adult body weight (kg)	NA [a]	70	70	70
IRA_a	adult indoor inhalation rate (m^3/day)	NA [a]	20	20	20
EF_{ni}	non-industrial exposure frequency (days/year)	NA [a]	350	350	350
AT_{nni}	averaging time- noncarcinogens, non-industrial (yr)	NA [a]	30	30	30
ED_{ni}	non-industrial exposure duration (yr)	NA [a]	30	30	30

[a]Not Applicable.
[b]Chemical-specific.

A C_{ani} shall be determined for both carcinogenic and noncarcinogenic effects and the more conservative value shall be used as the RS.

Risk-Based C_a Industrial/Commerical Land Use (C_{ai})

C_{ai} – Carcinogenic Effects (ug/m^3):

$$\frac{TR x BW_a x AT_c x 365 \frac{days}{years} x 10^3 \frac{\mu g}{mg}}{SF_i x IRA_a x EF_i x ED_i} \qquad \textbf{(EQ59)}$$

where:

Parameter	Definiton (units)	Input Value (Default Value)			
		SO	**MO-1**	**MO-2**	**MO-3**
C_{ai}	industrial risk-based chemical concentration in air for enclosed structure (indoor) vapor inhalation (µg/m^3)	NA [a]	--	--	--
TR	target excess individual lifetime cancer risk (unitless)	NA [a]	10^{-6}	10^{-6}	10^{-6} [b]
SF_i	inhalation cancer slope factor (mg/kg-day)$^{-1}$	NA [a]	CS [c]	CS [c]	CS [c]
EF_i	industrial exposure frequency (days/year)	NA [a]	250	250	SS [d] (250)
ED_i	industrial exposure duration (yr)	NA [a]	25	25	SS [d] (25)
BW_a	average adult body weight (kg)	NA [a]	70	70	70
AT_c	averaging time - carcinogens (yr)	NA [a]	70	70	70
IRA_a	adult inhalation rate (m^3/day)	NA [a]	20	20	SS [d] (20)

[a]Not Applicable.
[b]Refer to Section 2.14.3.
[c]Chemical-specific.
[d]Site-specific.

C_{ai} – Noncarcinogenic Effects (ug/m^3):

$$C_{ai}(\mu g/m^3) = \frac{THQ \, x \, RfD_i \, x \, BW_a \, x \, AT_{ni} \, x \, 365 \frac{days}{year} \, x \, 10^3 \frac{\mu g}{mg}}{IRA_a \, x \, EF_i \, x \, ED_i} \qquad \textbf{(EQ60)}$$

where:

Parameter	Definition (units)	Input Value			
		SO	MO-1	MO-2	MO-3
C_{ai}	industrial risk-based chemical concentration in air for enclosed structure (indoor) vapor inhalation (µg/m^3)	NA [a]	--	--	--
THQ	target hazard quotient (unitless)	NA [a]	1.0	1.0	1.0
RfD_i	inhalation reference dose (mg/kg-day)	NA [a]	CS [b]	CS [b]	CS [b]
BW_a	adult body weight (kg)	NA [a]	70	70	70
IRA_a	adult inhalation rate (m^3/day)	NA [a]	20	20	SS [c] (20)
EF_i	industrial exposure frequency (days/year)	NA [a]	250	250	SS [c] (250)
AT_{ni}	averaging time- noncarcinogen, industrial (yr)	NA [a]	25	25	SS [c] (25)
ED_i	industrial exposure duration (yr)	NA [a]	25	25	SS [c] (25)

[a]Not Applicable.
[b]Chemical-specific.
[c]Site-specific.

A C_{ai} shall be determined for both carcinogenic and noncarcinogenic effects and the more conservative value shall be used as the RS.

H2.4 Summers Model

The mixing of unimpacted groundwater with impacted infiltration and the resultant concentrations in groundwater are estimated using the Summers Model:

$DF_{Summers}$:

$$\frac{(Q_\rho + Q_a)}{Q_\rho} = \frac{C_l}{C_{si}} \qquad \textbf{(EQ61)}$$

where:

Parameter	Definition (units)	Input Value
C_{si}	constituent concentration in the groundwater (mg/l or g/m^3)	--
Q_ρ	volumetric flow rate of infiltration (soil pore water) from the AOI into the aquifer (m^3/day)	site-specific (refer to EQ61)
Q_a	volumetric flow rate of groundwater (m^3/day)	site-specific (refer to EQ62)
C_l	dissolved constituent concentration in the liquid phase (mg/l)	site-specific (refer to EQ63)

The volumetric flow rate of infiltration from the AOI into the aquifer:

Q_ρ (m^3/day):

$I \times S_W \times L$ **(EQ62)**

where:

Parameter	Definition (units)	Input Value (Default Value)
Q_ρ	volumetric flow rate of infiltration (soil pore water) from the AOI into the aquifer (m^3/day)	site-specific
I	infiltration rate (m/yr)	site-specific (0.1) [a]
S_W	source width perpendicular to groundwater flow (m)	site-specific
L	length of impacted area parallel to flow direction of aquifer (m)	site-specific

[a]*Soil Screening Guidance, User's Guide*, EPA 1996.

The volumetric flow rate of the groundwater is estimated as:

Q_a (m^3/day):

$D_v \times S_d \times S_W$ **(EQ63)**

where:

Parameter	Definition (units)	Input Value (Default Value)
Q_a	volumetric flow rate of groundwater (m^3/day)	--
D_v	groundwater darcy velocity in the aquifer (K x i) (m/yr)	site-specific (9.144 m/yr)
S_d	source thickness (i.e., the thickness of the impacted groundwater within the permeable zone) (m)	refer to EQ39
S_W	width of impacted area perpendicular to flow direction of aquifer (m)	site-specific

The aqueous-phase concentration (C_l) is estimated from the total soil concentration (C_{Tw}) as follows:

C_l (mg/l):

$$C_{Tw}\left(\frac{[(\rho_w x\theta_w)+\rho_b]}{\rho_b K_d+\theta_w+(n-\theta_w)xH'}\right) \qquad \textbf{(EQ64)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)
C_l	dissolved constituent concentration in the liquid phase (mg/l)	--
C_{Tw}	total soil concentration on a wet weight basis (mg/kg)	site-specific
ρ_w	density of water (g/cm^3)	1.0
ρ_b	dry bulk density of soil (g/cm^3)	site-specific (1.7) [a]
ρ_s	soil particle density (g/cm^3)	site-specific (2.65) [a]
n	total porosity of soil (L_{pore}/L_{soil})	site-specific (1 - ρ_b/ρ_s)
θ_w	water filled soil porosity (L_{water}/L_{soil})	site-specific (0.21) [a]
K_{oc}	soil organic carbon partition coefficient (cm^3/g)	chemical specific
f_{oc}	fractional organic carbon in soil = percent organic matter /174 (g/g) (ASTM 2974)	site-specific (0.006) [a]
K_d	soil water partition coefficient = K_{oc} x f_{oc} (cm^3/g)	chemical-specific
H'	Henry's Law Constant (dimensionless)	chemical-specific [b]

[a]LDEQ default value.
[b]H' = H x 41 where: H = Henry's Law Constant (atm-m^3/mol); R = Universal Law Constant (0.0000821 atm-m^3/mole-^oK); and T = Absolute temperature of soil (^oK) [273 + ^oC (25^oC)].

H2.5 Domenico Model

Before site-specific $DAF_{Domenico}$ values are developed using the Domenico model equation presented below, the boundary conditions used to derive this equation shall be reviewed to determine if all of the assumptions are appropriate for the case being modeled (see reference) [a]. The Department will only allow the use of a $DAF_{Domenico}$ that is based on the modeling of an infinite permeable zone to a distance of 2000 feet if constituent retardation and first-order degradation rate values are set to LDEQ default values (an equivalent situation was provided to typical UST sites). Otherwise, site-specific conditions (geological conditions) are to be taken into account in the model equation. If there is the potential for constituent migration to be influenced by pumping activities within the zone, a site-specific DAF shall not be calculated using the Domenico model. The Submitter may develop a site-specific DAF using an appropriate model under MO-3. An example $DAF_{Domenico}$ calculation of a case where the vertical boundary of the permeable zone is finite and the horizontal boundary of the permeable zone is considered infinite is provided at the end of this Appendix.

$DAF_{Domenico}$ [a]:

$$\frac{C_{si}}{C_{(x)i}} = 1 / \left(\exp\left(\frac{x}{2\alpha_x} \left[1 - \sqrt{1 + \frac{4\lambda_i \alpha_x R_i}{v}} \right] \right) \left(erf\left[\frac{S_w}{4\sqrt{\alpha_y x}} \right] \right) \left(erf\left[\frac{S_d}{2\sqrt{\alpha_z x}} \right] \right) \right) \qquad \textbf{(EQ65)}$$

where:

Parameter	Definition	Input Value (Default Value)		
		MO-1	MO-2	MO-3
$C_{(x)i}$	concentration of constituent i in groundwater at distance *x* downstream of source (mg/L) or (mg/m^3)	--	--	--
C_{si}	concentration of constituent i in source zone (mg/L) or (mg/m^3)	--	--	--
S_w	source width perpendicular to groundwater flow (m)	45 [b]	SS [c]	SS [c]
D_v	groundwater Darcy velocity (K x i) (m/yr)	9.1 [d]	SS [c] (9.1)	SS [c] (9.1)
n	total soil porosity (L_{pore}/L_{soil}))	0.36 [d]	SS [c] ($1-\rho_b/\rho_s$)	SS [c] ($1-\rho_b/\rho_s$)
λ_i	first-order degradation rate for constituent i (day^{-1})	0 [d]	SS [c,e] (0)	SS [c,e] (0)
R_i	constituent retardation factor (dimensionless)	1 [d]	SS [c,e] (1)	SS [c,e] (1)
i	hydraulic gradient (dimensionless)	--	SS [c]	SS [c]
ν	groundwater seepage velocity (m/yr)	25.4	(K x i)/n	(K x i)/n
x	distance downgradient from source (m)	SS [c]	SS [c]	SS [c]
K	hydraulic conductivity (m/yr)		SS [c]	SS [c]

α_x	longitudinal groundwater dispersivity (m)	(x * 0.1)	(x * 0.1)	(x * 0.1)
α_y	transverse groundwater dispersivity (m)	(α_x / 3)	(α_x / 3)	(α_x / 3)
α_z	vertical groundwater dispersivity (m)	(α_x / 20) or L/200	(α_x / 20) or L/200	(α_x / 20) or L/200
erf	error function; $erf\chi = \frac{2}{\sqrt{\pi}}\int_o^\chi e^{-t^2}\,dt$	refer below	refer below	refer below
S_d	source thickness (i.e., the thickness of the impacted groundwater within the permeable zone) (m)	SS [c,f]	SS [c,f]	SS [c,f]
ρ_b	dry soil bulk density (g/cm^3)	1.7 [d]	SS (1.7) [d]	SS (1.7) [d]
ρ_s	soil partical density (g/cm^3)	2.65 [d]	SS (2.65) [d]	SS (2.65) [d]

[a]Domenico, P.A. and F.W. Schwartz, 1990. *Physical and Chemical Hydrogeology,* John Wiley and Sons, New York, N.Y.
[b]Based on a 0.5 acre source.
[c]Site-specific.
[d]LDEQ default value.
[e]Degradation and/or retardation shall only be included in the model when site-specific quantitative data documents occurrence. Derivation of constants for these processes shall be included with the model input data. Degradation and retardation data are by definition monitored natural attenuation processes. Therefore, literature values for retardation and degradation are not acceptable under the RECAP.
[f]Estimation of S_d using Method 1 or 2 as presented below.

The $\mathbf{S_d}$ is defined as the thickness of the contaminated groundwater within the permeable zone. Refer to Figure H-1 for an illustration of S_d.

For the purpose of developing a $DAF_{Domenico}$ for GW_2, LDEQ requires that the S_d be estimated using Method 1 or 2. If the estimated S_d value exceeds the aquifer thickness, S_d should be set to the thickness of the aquifer.

Method 1: Sum of advective and dispersive depths:

$$S_d = h_{adv} + h_{disp} \qquad \textbf{(EQ66)}$$

where:

Parameter	Definition (units)	Input Value (Default Value)
S_d	source thickness (i.e., the thickness of the impacted groundwater within the permeable zone) (m)	--
h_{adv}	advective component of the plume depth (m)	site-specific
h_{disp}	dispersive component of the plume depth (m)	Site-specific

$h_{adv} = B[1\text{-}exp((-I \times L)/(B \times D_v))]$ **(EQ67)**

where:

Parameter	Definition (units)	Input Value (Default Value)
h_{adv}	advective component of the plume depth (m)	site-specific
I	infiltration rate (m/yr)	site-specific (0.1) [a]
D_v	Darcy groundwater velocity (K x i) (m/yr)	site-specific (9.144) [a]
B	thickness of the shallow water bearing zone (m)	site-specific (< 6.1) [a]
L	length of the source parallel to the groundwater flow at the water table (m)	site-specific

[a]LDEQ default value.

$h_{disp} = (2 \times \alpha_z \times L)^{1/2}$ **(EQ68)**

where:

Parameter	Definition (units)	MO-2 Input Value (Default Value)
h_{disp}	dispersive component of the plume depth (m)	site-specific
α_z	vertical groundwater dispersivity (m)	site-specific (α_x/20) or (L/200) [a]
L	length of the source parallel to the groundwater flow at the water table (m)	site-specific

Method 2: Thickness of the aquifer:

The thickness of the impacted permeable zone shall be used as the S_d if the thickness of the groundwater plume is not known.

SOLUTION TO THE ERROR FUNCTION

χ	**erf χ**
0.00	0.000 000
0.05	0.056 372
0.10	0.112 463
0.15	0.167 996
0.20	0.222 703
0.25	0.276 326
0.30	0.328 627
0.35	0.379 382
0.40	0.428 392
0.45	0.475 482
0.50	0.520 500
0.55	0.563 323
0.60	0.603 856
0.65	0.642 029
0.70	0.677 801
0.75	0.711 156
0.80	0.742 101
0.85	0.770 668
0.90	0.796 908
0.95	0.820 891
1.00	0.842 701
1.1	0.880 205
1.2	0.910 314
1.3	0.934 008
1.4	0.952 285
1.5	0.966 105
1.6	0.976 348
1.7	0.983 790
1.8	0.989 091
1.9	0.992 790
2.0	0.995 322
2.2	0.998 137
2.4	0.999 311
2.6	0.999 764
2.8	0.999 925
3.0	0.999 978
3.2	0.999 994
3.4	0.999 998
3.6	1.000 000
3.8	1.000 000
≥ 4.0	1.000 000

TABLE H-3
HIERARCHY OF REFERENCES FOR CHEMICAL-SPECIFIC AND TOXICITY VALUES USED FOR THE GENERATION OF THE SS AND MO-1 RS

K_{oc}:

(1) *Soil Screening Guidance: Technical Background Document* (EPA 1996)
(2) *Groundwater Chemicals Desk Reference*, 1990
(3) *Groundwater Chemicals Desk Reference*, Vol. 2, 1991
(4) *Handbook of Environmental Fate and Exposure Data or Organic Chemicals*, Volume IV, 1991
(5) *Handbook of Environmental Fate and Exposure Data or Organic Chemicals*, Volume III, 1991
(6) *Soil Chemistry of Hazardous Materials*, 1988
(7) Total Petroleum Hydrocarbon Working Group, 1997

Henry's Law Constant:

(1) *Soil Screening Guidance: Technical Background Document* (EPA 1996)
(2) *Superfund Chemical Data Matrix* (EPA 1994)
(3) *Groundwater Chemicals Desk Reference*, 1990. Montgomery, John H., Welkom, Linda, Michigan: M. Lewis Publishing, Inc.
(4) *Handbook of Environmental Fate and Exposure Data for Organic Chemicals Volume IV,* 1991
(5) Total Petroleum Hydrocarbon Criteria Working Group, 1997

Solubility:

(1) *Soil Screening Guidance: Technical Background Document* (EPA 1996)
(2) *Superfund Chemical Data Matrix* (EPA 1994)
(3) *Air Emissions Models for Waste and Wastewater*, 1994

Diffusivity:

(1) *Soil Screening Guidance: Technical Background Document* (EPA 1996)
(2) *Air Emissions Models for Waste and Wastewater*, 1994
(3) CHEMDAT 8

Air diffusivities (D_A) were estimated using the following equation:

$$\frac{D_{A_b}}{D_{A_a}} = \sqrt{\frac{MW_a}{MW_b}}$$

where:

TABLE H-3
(Continued)

MW = molecular weight
a = chemical a
b = chemical b
D_A = diffusivity coefficient in air

Note: Either chemical a or chemical b must have a published diffusivity value to use this equation. Dragun, James. 1988. *The Soil Chemistry of Hazardous Materials*, Hazardous Materials Control Research Institute, Silver Springs, Maryland.

Water diffusivities (D_W) were estimated using the following algorithm:

$$\frac{D_{W_b}}{D_{W_a}} = \sqrt{\frac{MW_a}{MW_b}}$$

where:
MW = molecular weight
a = chemical a
b = chemical b
D_W = diffusivity coefficient in water

Note: Either chemical a or chemical b must have a published diffusivity value to use this equation.

RfD and SF:

(1) IRIS (*Integrated Risk Information System*, EPA, http://www.epa.gov/iris/)

(2) HEAST (*Health Effects Assessment Summary Tables*, EPA)

(3) HEAST alternative method or EPA NCEA Superfund Health Risk Technical Support Center (EPA Region III *Risk-based Concentration Tables,* http://www.epa.gov/reg3hwmd/risk/riskmenu.htm; EPA Region IX *Preliminary Remediation Goals*, http://www.epa.gov/region09/waste/sfund/prg/index.html; or EPA Region VI *Human Health Medium-Specific Screening Levels*, http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm)

(4) Withdrawn from IRIS or HEAST (EPA Region III Risk-based Concentration Tables, EPA Region IX Preliminary Remediation Goals, or EPA Region VI Human Health Medium-Specific Screening Levels)

TABLE H-3
(Continued)

REFERENCES FOR CHEMICAL-SPECIFIC PARAMETERS

Dragun, J., *Soil Chemistry of Hazardous Materials*, 1988.

Howard, P.H., *Handbook of Environmental Fate and Exposure Data for Organic Chemicals, vol. IV, 1993.* Lewis Publishers, Inc. 121 South Main Street, Chelsea, Michigan 48118.

Howard, P.H., *Handbook of Environmental Fate and Exposure Data for Organic Chemicals, vol. II, 1993.* Lewis Publishers, Inc. 121 South Main Street, Chelsea, Michigan 48118.

Montgomery, J.H., and Welkom, L.M., *Groundwater Chemicals Desk Reference,* 1990. Lewis Publishers, Inc. 121 South Main Street, Chelsea, Michigan 48118.

Montgomery, J.H., and Welkom, L.M., *Groundwater Chemicals Desk Reference*, vol. 2. 1991. Lewis Publishers, Inc. 121 South Main Street, Chelsea, Michigan 48118.

Gustafson, J.B., *Selection of Representative TPH Fractions Base on Fate and Transport Considerations,* Total Petroleum Hydrocarbon Criteria Workgroup, 1997.

U. S. EPA (Environmental Protection Agency). November 1994. *Air Emissions Models for Waste and Wastewaters.* Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711. USEPA Contract No. 68D10118. EPA/453/R/94/080A.

U. S. EPA (Environmental Protection Agency). 1996. *Soil Screening Guidance: Technical Background Document.* EPA/540/R-96/018. Office of Emergency and Remedial Response, Washington, D.C. NTIS PB96-963505.

U. S. EPA (Environmental Protection Agency). June 1994. *Superfund Chemical Data Matrix.* EPA/540/R-94/00. Solid Waste and Emergency Response (5204G), Washington, D.C. NTIS PB94-963506.

U. S. EPA (Environmental Protection Agency). November 1994. *CHEMDAT8, Compound Properties Estimation and Data,* ver 1.0. Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27709.

TABLE H-6
DERMAL ABSORPTION FACTORS

Constituent	**ABS (unitless)**
Arsenic	0.03
Cadmium	0.001
Chlordane	0.04
2,4-D	0.05
DDT	0.03
Gamma-hexachlorocyclohexane	0.04
TCDD	0.03
Pentachlorophenol	0.25
Polychlorinated biphenyls	0.14
Polycyclic aromatic hydrocarbons	0.13
Other semivolatile organic constituents	0.10
Other inorganic constituents (metals)	0
Volatile constituents	0

The dermal ABS values were obtained from *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim Guidance.* EPA 2000. EPA/540/R-99/005.

LDEQ RECAP TABLE H 5
MANAGEMENT OPTION 1 AND 2
STANDARDS FOR Ca
(ug/m3)

		Cani C-O	Cani N-O		Cai C-O	Cai N-O	
COMPOUND	CAS #	(ug/m3)	(ug/m3)	Note	(ug/m3)	(ug/m3)	Note
Acenaphthene	83-32-9		2.2E+02	J		3.1E+02	J
Acenaphthylene	208-96-8		2.2E+02	J		3.1E+02	J
Acetone	67-64-1		3.7E+02	J		5.1E+02	J
Aldrin	309-00-2						
Aniline	62-53-3						
Anthracene	120-12-7		1.1E+03	J		1.5E+03	J
Antimony	7440-36-0						
Arsenic	7440-38-2						
Barium	7440-39-3						
Benzene	71-43-2	1.2E+01		K	1.2E+01		K
Benz(a)anthracene	56-55-3						
Benzo(a)pyrene	50-32-8						
Benzo(b)fluoranthene	205-99-2						
Benzo(k)fluoranthene	207-08-9						
Beryllium	7440-41-7						
Biphenyl,1,1-	92-52-4		2.4E+01	K		2.4E+01	K
Bis(2-chloroethyl)ether	111-44-4	3.0E-01		K	3.0E-01		K
Bis(2-chloroisopropyl)ether	108-60-1	1.9E-01	1.5E+02	J	4.1E-01	2.0E+02	J
Bis(2-ethyl-hexyl)phthalate	117-81-7						
Bromodichloromethane	75-27-4	1.1E-01	7.3E+01	J	2.3E-01	1.0E+02	J
Bromoform	75-25-2	1.7E+00	7.3E+01	J	3.7E+00	1.0E+02	J
Bromomethane	74-83-9		5.2E+00	J		7.3E+00	J
Butyl benzyl phthalate	85-68-7						
Cadmium	7440-43-9						
Carbon Disulfide	75-15-0		7.1E+01	K		7.1E+01	K
Carbon Tetrachloride	56-23-5	6.7E+00		K	6.7E+00		K
Chlordane	57-74-9						
Chloroaniline,p-	106-47-8						
Chlorobenzene	108-90-7		1.1E+03	K		1.1E+03	K
Chlorodibromomethane	124-48-1	7.9E-02	7.3E+01	J	1.7E-01	1.0E+02	J
Chloroethane (Ethylchloride)	75-00-3		6.3E+04	K		6.3E+04	K

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE H 5
MANAGEMENT OPTION 1 AND 2
STANDARDS FOR Ca
(ug/m3)

		Cani C-O	Cani N-O		Cai C-O	Cai N-O	
COMPOUND	CAS #	(ug/m3)	(ug/m3)	Note	(ug/m3)	(ug/m3)	Note
Chloroform	67-66-3	4.3E+00		K	4.3E+00		K
Chloromethane	74-87-3	5.6E+01		K	5.6E+01		K
Chloronaphthalene,2-	91-58-7		2.9E+02	J		4.1E+02	J
Chlorophenol,2-	95-57-8		1.8E+01	J		2.6E+01	J
Chromium(III)	16065-83-1						
Chromium(VI)	18540-29-97						
Chrysene	218-01-9						
Cobalt	7440-48-4						
Copper	7440-50-8						
Cyanide (free)	57-12-5						
DDD	72-54-8						
DDE	72-55-9						
DDT	50-29-3						
Dibenz(a,h)anthracene	53-70-3						
Dibenzofuran	132-64-9		1.5E+01	J		2.0E+01	J
Dibromo-3-chloropropane,1,2-	96-12-8						
Dichlorobenzene,1,2-	95-50-1		2.1E+02	J		2.9E+02	J
Dichlorobenzene,1,3-	541-73-1		3.3E+00	J		4.6E+00	J
Dichlorobenzene,1,4-	106-46-7		1.4E+03	K		1.4E+03	K
Dichlorobenzidine,3,3-	91-94-1						
Dichloroethane,1,1-	75-34-3		5.2E+02	J		7.3E+02	J
Dichloroethane,1,2-	107-06-2	3.9E+00		K	3.9E+00		K
Dichloroethene,1,1-	75-35-4		2.1E+02	J		2.9E+02	J
Dichloroethene,cis,1,2-	156-59-2		3.7E+01	J		5.1E+01	J
Dichloroethene,trans,1,2-	156-60-5		7.3E+01	J		1.0E+02	J
Dichlorophenol,2,4-	120-83-2						
Dichloropropane,1,2-	78-87-5		8.3E+03	K		8.3E+03	K
Dichloropropene,1,3-	542-75-6		1.1E+02	K		1.1E+02	K
Dieldrin	60-57-1						
Diethylphthalate	84-66-2						
Dimethylphenol,2,4-	105-67-9						

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE H 5
MANAGEMENT OPTION 1 AND 2
STANDARDS FOR Ca
(ug/m3)

COMPOUND	CAS #	Cani C-O (ug/m3)	Cani N-O (ug/m3)	Note	Cai C-O (ug/m3)	Cai N-O (ug/m3)	Note
Dimethylphthalate	131-11-3						
Di-n-octylphthalate	117-84-0						
Dinitrobenzene,1,3-	99-65-0						
Dinitrophenol,2,4-	51-28-5						
Dinitrotoluene,2,6-	606-20-2						
Dinitrotoluene,2,4-	121-14-2						
Dinoseb	88-85-7						
Endosulfan	115-29-7						
Endrin	72-20-8						
Ethyl benzene	100-41-4		1.0E+04	K		1.0E+04	K
Fluoranthene	206-44-0						
Fluorene	86-73-7		1.5E+02	J		2.0E+02	J
Heptachlor	76-44-8						
Heptachlor epoxide	1024-57-3						
Hexachlorobenzene	118-74-1	2.0E-01		K	2.0E-01		K
Hexachlorobutadiene	87-68-3						
Hexachlorocyclohexane,alpha	319-84-6						
Hexachlorocyclohexane,beta	319-85-7						
Hexachlorocyclohexane,gamma	58-89-9						
Hexachlorocyclopentadiene	77-47-4		2.1E-01	J		2.9E-01	J
Hexachloroethane	67-72-1	2.5E+01		K	2.5E+01		K
Indeno(1,2,3-cd)pyrene	193-39-5						
Isobutyl alcohol	78-83-1						
Isophorone	78-59-1						
Lead (inorganic)	7439-92-1						
Mercury (inorganic)	7487-94-7						
Methoxychlor	72-43-5						
Methylene chloride	75-09-2	2.1E+02		K	2.1E+02		K
Methyl ethyl ketone	78-93-3		1.4E+04	K		1.4E+04	K
Methyl isobutyl ketone	108-10-1		4.9E+03	K		4.9E+03	K
Methylnaphthalene,2-	91-57-6		3.1E+00	J		4.4E+00	J

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE H 5
MANAGEMENT OPTION 1 AND 2
STANDARDS FOR Ca
(ug/m3)

COMPOUND	CAS #	Cani C-O (ug/m3)	Cani N-O (ug/m3)	Note	Cai C-O (ug/m3)	Cai N-O (ug/m3)	Note
MTBE (methyl tert-butyl ether)	1634-04-4		3.1E+03	J		4.4E+03	J
Naphthalene	91-20-3		3.1E+00	J		4.4E+00	J
Nickel	7440-02-0						
Nitrate	14797-55-8						
Nitrite	14797-65-0						
Nitroaniline,2-	88-74-4		1.1E-01	J		1.5E-01	J
Nitroaniline,3-	99-09-2		1.1E+01	J		1.5E+01	J
Nitroaniline,4-	100-01-6						
Nitrobenzene	98-95-3		1.2E+02	K		1.2E+02	K
Nitrophenol,4-	100-02-7						
Nitrosodi-n-propylamine,n-	621-64-7						
N-nitrosodiphenylamine	86-30-6						
Pentachlorophenol	87-86-5						
Phenanthrene	85-01-8		1.1E+03	J		1.5E+03	J
Phenol	108-95-2		1.1E+03	J		1.5E+03	J
Polychlorinated biphenyls	1336-36-3						
Pyrene	129-00-0		1.1E+02	J		1.5E+02	J
Selenium	7782-49-2						
Silver	7440-22-4						
Styrene	100-42-5		1.0E+03	K		1.0E+03	K
Tetrachlorobenzene,1,2,4,5-	95-94-3						
Tetrachloroethane,1,1,1,2-	630-20-6	1.0E-01		K	1.0E-01		K
Tetrachloroethane,1,1,2,2-	79-34-5	1.7E+00		K	1.7E+00		K
Tetrachloroethylene	127-18-4	1.1E+02		K	1.1E+02		K
Tetrachlorophenol,2,3,4,6-	58-90-2						
Thallium	7440-28-0						
Toluene	108-88-3		4.0E+02	K		4.0E+02	K
Toxaphene	8001-35-2						
Trichlorobenzene,1,2,4-	120-82-1		2.1E+02	J		2.9E+02	J
Trichloroethane,1,1,1-	71-55-6		1.0E+03	J		1.5E+03	J
Trichloroethane,1,1,2-	79-00-5	6.3E+00		K	6.3E+00		K

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE H 5
MANAGEMENT OPTION 1 AND 2
STANDARDS FOR Ca
(ug/m3)

COMPOUND	CAS #	Cani C-O (ug/m3)	Cani N-O (ug/m3)	Note	Cai C-O (ug/m3)	Cai N-O (ug/m3)	Note
Trichloroethene	79-01-6	5.9E+01		K	5.9E+01		K
Trichlorofluoromethane	75-69-4		7.3E+02	J		1.0E+03	J
Trichlorophenol,2,4,5-	95-95-4						
Trichlorophenol,2,4,6-	88-06-2						
Vanadium	7440-62-2						
Vinyl chloride	75-01-4	1.2E+00		K	1.2E+00		K
Xylene(mixed)	1330-20-7		1.1E+02	J		1.5E+02	J
Zinc	7440-66-6						
Aliphatics C6-C8	NA		1.9E+04	J		1.9E+04	J
Aliphatics >C8-C10	NA		1.1E+03	J		1.1E+03	J
Aliphatics >C10-C12	NA		1.1E+03	J		1.1E+03	J
Aliphatics >C12-C16	NA		1.1E+03	J		1.1E+03	J
Aliphatics >C16-C35	NA						
Aromatics >C8-C10	NA		2.2E+02	J		2.2E+02	J
Aromatics >C10-C12	NA		2.2E+02	J		2.2E+02	J
Aromatics >C12-C16	NA		2.2E+02	J		2.2E+02	J
Aromatics >C16-C21	NA						
Aromatics >C21-C35	NA						
TPH-GRO	NA		2.2E+02			2.2E+02	
TPH-DRO	NA						
TPH-ORO	NA						

J - Risk-based value calculated with one of the equations EQ 56 thru 59.

K - Louisiana Toxic Air Pollutant Ambient Air Standards (LAC 33:III.5112 Table 51.2).

* The Ca values presented in this table shall be used for the development of site-specific SOILes, GWes, and GWair RS under MO-2. For the use of an alternate Ca value under MO-3, refer to Section H2.3.

NOTE: See end of Table for designation of letter symbols and footnotes.

Risk Evaluation/ Corrective Action Program (RECAP)

Prepared by:
Louisiana
Department of
Environmental
Quality
Corrective Action
Group
August 4, 2003

Welcome to the **Louisiana Department of Environmental Quality's Risk Evaluation/Corrective Action Program (RECAP) workbook**. This workbook contains all of the Management Option 2 (MO-2) equations, except for the Domenico model. There is a spreadsheet for each of the MO-2 exposure pathways. Each spreadsheet lists the equations used to calculate a RECAP Standard and contains the calculations of the RECAP Standards for all of the chemicals listed in the document for that exposure pathway. Within the spreadsheets are comment boxes for each equation. The comment box contains the parameter definitions and the default values for that equation. (Point the mouse at the cell and rick click into that cell that contains the red triangle in the upper right corner and click show comment. Click the comment box to highlight the box drag the edge of the box to enlarge the cell to read the contents.)

The spreadsheets are linked together for data that is common to most of the equations (e.g., the Slope Factor (SF) and Reference dose (RfD) values are contained in one spreadsheet, "SF&RfD"). Site-specific data that can be entered under MO-2 is highlighted in blue. Site-specific input values related to a specific exposure pathway are listed in that exposure pathway spreadsheet. Site-specific values are found in the "Soil properties", "Sd & DAF Summers", "Soil-PEF", "Soiles", "GWes", and "GWair" spreadsheets. The soil properties spreadsheet is the only spreadsheet that contains site-specific input values that can be changed that will effect many of the equations. Site size can be entered as the length and width.

At the bottom of each spreadsheet are several rows highlighted in blue for additional chemicals.

COMPOUND	CAS #	SF_o	REF	SF_i	REF	RfD_o	REF	RfD_i	REF	ABS
		$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$		mg/kg-day		mg/kg-day		unitless
Acenaphthene	83-32-9	*******		*******		6.00E-02	I	6.00E-02	*	0
Acenaphthylene	208-96-8	*******		*******		6.00E-02	S	6.00E-02	*	0
Acetone	67-64-1	*******		*******		1.00E-01	I	1.00E-01	*	0
Aldrin	309-00-2	1.70E+01	I	1.71E+01	I	3.00E-05	I	3.00E-05	*	0.1
Aniline	62-53-3	5.70E-03	I	5.70E-03	*	7.00E-03	E	2.86E-04	I	0.1
Anthracene	120-12-7	*******		*******		3.00E-01	I	3.00E-01	*	0
Antimony	7440-36-0	*******		*******		4.00E-04	I	4.00E-04	*	0
Arsenic	7440-38-2	1.50E+00	I	1.51E+01	I	3.00E-04	I	3.00E-04	*	0.03
Barium	7440-39-3	*******		*******		7.00E-02	I	1.43E-04	H	0
Benzene	71-43-2	2.90E-02	I	2.90E-02	I	4.00E-03	I	8.60E-03	I	0
Benz(a)anthracene	56-55-3	7.30E-01	E	3.10E-01	E	*******		*******		0.13
Benzo(a)pyrene	50-32-8	7.30E+00	I	3.10E+00	E	*******		*******		0.13
Benzo(b)fluoranthene	205-99-2	7.30E-01	E	3.10E-01	E	*******		*******		0.13
Benzo(k)fluoranthene	207-08-9	7.30E-02	E	3.10E-02	E	*******		*******		0.13
Beryllium	7440-41-7	*******		8.40E+00	I	2.00E-03	I	5.70E-06	I	0
Biphenyl,1,1-	92-52-4	*******		*******		5.00E-02	I	5.00E-02	*	0
Bis(2-chloroethyl)ether	111-44-4	1.10E+00	I	1.16E+00	I	*******		*******		0
Bis(2-chloroisopropyl)ether	108-60-1	7.00E-02	H	3.50E-02	H	4.00E-02	I	4.00E-02	*	0
Bis(2-ethyl-hexyl)phthalate	117-81-7	1.40E-02	I	1.40E-02	*	2.00E-02	I	2.00E-02	*	0.1
Bromodichloromethane	75-27-4	6.20E-02	I	6.20E-02	*	2.00E-02	I	2.00E-02	*	0
Bromoform	75-25-2	7.90E-03	I	3.85E-03	I	2.00E-02	I	2.00E-02	*	0
Bromomethane	74-83-9	*******		*******		1.40E-03	I	1.43E-03	I	0
Butyl benzyl phthalate	85-68-7	*******		*******		2.00E-01	I	2.00E-01	*	0.1
Cadmium	7440-43-9	*******		6.30E+00	I	5.00E-04	I,D	5.71E-05	W	0.001
Carbon Disulfide	75-15-0	*******		*******		1.00E-01	I	2.00E-01	I	0
Carbon Tetrachloride	56-23-5	1.30E-01	I	5.25E-02	I	7.00E-04	I	5.71E-04	W	0
Chlordane	57-74-9	3.50E-01	I	3.50E-01	I	5.00E-04	I	2.00E-04	I	0.04
Chloroaniline,p-	106-47-8	*******		*******		4.00E-03	I	4.00E-03	*	0.1
Chlorobenzene	108-90-7	*******		*******		2.00E-02	I	1.70E-02	E	0
Chlorodibromomethane	124-48-1	8.40E-02	I	8.40E-02	*	2.00E-02	I	2.00E-02	*	0
Chloroethane (Ethylchloride)	75-00-3	2.90E-03	E	2.90E-03	*	4.00E-01	E	2.86E+00	I	0
Chloroform	67-66-3	6.10E-03	W	8.05E-02	I	1.00E-02	I	8.60E-05	E	0
Chloromethane	74-87-3	1.30E-02	H	6.30E-03	H	8.60E-02	#	8.60E-02	E	0

NOTE: See end of Table for designation of letters and symbols.

COMPOUND	CAS #	SF_o	REF	SF_i	REF	RfD_o	REF	RfD_i	REF	ABS
		$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$		mg/kg-day		mg/kg-day		unitless
Chloronaphthalene,2-	91-58-7	*******		*******		8.00E-02	I	8.00E-02	*	0
Chlorophenol,2-	95-57-8	*******		*******		5.00E-03	I	5.00E-03	*	0
Chromium(III)	16065-83-1	*******		*******		1.50E+00	I	*******		0
Chromium(VI)	18540-29-97	*******		2.90E-02	I	3.00E-03	I	*******		0
Chrysene	218-01-9	7.30E-03	E	3.10E-03	E	*******		*******		0.13
Cobalt	7440-48-4	*******		*******		6.00E-02	E	5.70E-06	W	0
Copper	7440-50-8	*******		*******		4.00E-02	H	*******		0
Cyanide (free)	57-12-5	*******		*******		2.00E-02	I	*******		0.01
DDD	72-54-8	2.40E-01	I	2.40E-01	*	*******		*******		0.03
DDE	72-55-9	3.40E-01	I	3.40E-01	*	*******		*******		0.03
DDT	50-29-3	3.40E-01	I	3.40E-01	I	5.00E-04	I	5.00E-04	*	0.03
Dibenz(a,h)anthracene	53-70-3	7.30E+00	E	3.10E+00	E	*******		*******		0.13
Dibenzofuran	132-64-9	*******		*******		4.00E-03	E	4.00E-03	*	0
Dibromo-3-chloropropane,1,2-	96-12-8	1.40E+00	H	2.42E-03	H	5.71E-05	#	5.71E-05	I	0.1
Dichlorobenzene,1,2-	95-50-1	*******		*******		9.00E-02	I	5.70E-02	H	0
Dichlorobenzene,1,3-	541-73-1	*******		*******		9.00E-04	E	9.00E-04	*	0
Dichlorobenzene,1,4-	106-46-7	2.40E-02	H	2.40E-02	*	3.00E-02	E	2.29E-01	I	0
Dichlorobenzidine,3,3-	91-94-1	4.50E-01	I	4.50E-01	*	*******		*******		0.1
Dichloroethane,1,1-	75-34-3	*******		*******		1.00E-01	H	1.43E-01	H	0
Dichloroethane,1,2-	107-06-2	9.10E-02	I	9.10E-02	I	3.00E-03	*	2.90E-03	W	0
Dichloroethene,1,1-	75-35-4	*******		*******		5.00E-02	I	5.70E-02	I	0
Dichloroethene,cis,1,2-	156-59-2	*******		*******		1.00E-02	H	1.00E-02	*	0
Dichloroethene,trans,1,2-	156-60-5	*******		*******		2.00E-02	I	2.00E-02	*	0
Dichlorophenol,2,4-	120-83-2	*******		*******		3.00E-03	I	3.00E-03	*	0.1
Dichloropropane,1,2-	78-87-5	6.80E-02	H	6.80E-02	*	1.14E-03	*	1.14E-03	I	0
Dichloropropene,1,3-	542-75-6	1.00E-01	I	1.40E-02	I	3.00E-02	I	5.71E-03	I	0
Dieldrin	60-57-1	1.60E+01	I	1.61E+01	I	5.00E-05	I	5.00E-05	*	0.1
Diethylphthalate	84-66-2	*******		*******		8.00E-01	I	8.00E-01	*	0.1
Dimethylphenol,2,4-	105-67-9	*******		*******		2.00E-02	I	2.00E-02	*	0.1
Dimethylphthalate	131-11-3	*******		*******		1.00E+01	H	1.00E+01	*	0.1
Di-n-octylphthalate	117-84-0	*******		*******		4.00E-02	E	2.00E-02	*	0.1
Dinitrobenzene,1,3-	99-65-0	*******		*******		1.00E-04	I	1.00E-04	*	0.1
Dinitrophenol,2,4-	51-28-5	*******		*******		2.00E-03	I	2.00E-03	*	0.1

NOTE: See end of Table for designation of letters and symbols.

COMPOUND	CAS #	SF_o	REF	SF_i	REF	RfD_o	REF	RfD_i	REF	ABS
		$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$		mg/kg-day		mg/kg-day		unitless
Dinitrotoluene,2,6-	606-20-2	*******		*******		1.00E-03	H	1.00E-03	*	0.1
Dinitrotoluene,2,4-	121-14-2	*******		*******		2.00E-03	I	2.00E-03	*	0.1
Dinoseb	88-85-7	*******		*******		1.00E-03	I	1.00E-03	*	0.1
Endosulfan	115-29-7	*******		*******		6.00E-03	I	6.00E-03	*	0.1
Endrin	72-20-8	*******		*******		3.00E-04	I	3.00E-04	*	0.1
Ethyl benzene	100-41-4	*******		*******		1.00E-01	I	2.86E-01	I	0
Fluoranthene	206-44-0	*******		*******		4.00E-02	I	4.00E-02	*	0.13
Fluorene	86-73-7	*******		*******		4.00E-02	I	4.00E-02	*	0
Heptachlor	76-44-8	4.50E+00	I	4.55E+00	I	5.00E-04	I	5.00E-04	*	0.1
Heptachlor epoxide	1024-57-3	9.10E+00	I	9.10E+00	I	1.30E-05	I	1.30E-05	*	0.1
Hexachlorobenzene	118-74-1	1.60E+00	I	1.61E+00	I	8.00E-04	I	8.00E-04	*	0
Hexachlorobutadiene	87-68-3	7.80E-02	I	7.70E-02	I	2.00E-04	H	2.00E-04	*	0.1
Hexachlorocyclohexane,alpha	319-84-6	6.30E+00	I	6.30E+00	I	*******		*******		0.04
Hexachlorocyclohexane,beta	319-85-7	1.80E+00	I	1.80E+00	I	*******		*******		0.04
Hexachlorocyclohexane,gamma	58-89-9	1.30E+00	H	1.30E+00	*	3.00E-04	I	3.00E-04	*	0.04
Hexachlorocyclopentadiene	77-47-4	*******		*******		6.00E-03	I	5.70E-05	I	0
Hexachloroethane	67-72-1	1.40E-02	I	1.40E-02	I	1.00E-03	I	1.00E-03	*	0
Indeno(1,2,3-cd)pyrene	193-39-5	7.30E-01	E	3.10E-01	E	*******		*******		0.13
Isobutyl alcohol	78-83-1	*******		*******		3.00E-01	I	3.00E-01	*	0.1
Isophorone	78-59-1	9.50E-04	I	9.50E-04	*	2.00E-01	I	2.00E-01	*	0.1
Lead (inorganic)	7439-92-1	*******		*******		*******		*******		IEUBK
Mercury (inorganic)	7487-94-7	*******		*******		3.00E-04	I	8.57E-05	I	0
Methoxychlor	72-43-5	*******		*******		5.00E-03	I	5.00E-03	*	0.1
Methylene chloride	75-09-2	7.50E-03	I	1.64E-03	I	6.00E-02	I	8.57E-01	H	0
Methyl ethyl ketone	78-93-3	*******		*******		6.00E-01	I	2.86E-01	I	0
Methyl isobutyl ketone	108-10-1	*******		*******		8.00E-02	H	8.60E-01	I	0
Methylnaphthalene,2-	91-57-6	*******		*******		2.00E-02	S	8.60E-04	S	0
MTBE (methyl tert-butyl ether)	1634-04-4	*******		*******		8.57E-01	#	8.57E-01	I	0
Naphthalene	91-20-3	*******		*******		2.00E-02	I	8.60E-04	I	0
Nickel	7440-02-0	*******		*******		2.00E-02	I	*******		0
Nitrate	14797-55-8	*******		*******		1.60E+00	I	1.60E+00	*	0
Nitrite	14797-65-0	*******		*******		1.00E-01	I	1.00E-01	*	0
Nitroaniline,2-	88-74-4	*******		*******		3.00E-03	E	2.90E-05	E	0

NOTE: See end of Table for designation of letters and symbols.

LDEQ RECAP
APPENDIX H: TABLE H1
CANCER SLOPE FACTORS AND REFERENCE DOSES

COMPOUND	CAS #	SF_o	REF	SF_i	REF	RfD_o	REF	RfD_i	REF	ABS
		$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$		mg/kg-day		mg/kg-day		unitless
Nitroaniline,3-	99-09-2	*******		*******		3.00E-03	O	3.00E-03	*	0
Nitroaniline,4-	100-01-6	*******		*******		3.00E-03	O	3.00E-03	*	0.1
Nitrobenzene	98-95-3	*******		*******		5.00E-04	I	5.71E-04	H	0
Nitrophenol,4-	100-02-7	*******		*******		8.00E-03	E	8.00E-03	*	0.1
Nitrosodi-n-propylamine,n-	621-64-7	7.00E+00	I	7.00E+00	*	*******		*******		0.1
N-nitrosodiphenylamine	86-30-6	4.90E-03	I	4.90E-03	*	*******		*******		0.1
Pentachlorophenol	87-86-5	1.20E-01	I	1.20E-01	*	3.00E-02	I	3.00E-02	*	0.25
Phenanthrene	85-01-8	*******		*******		3.00E-01	S	3.00E-01	*	0
Phenol	108-95-2	*******		*******		3.00E-01	I	3.00E-01	*	0
Polychlorinated biphenyls	1336-36-3	2.00E+00	I	2.00E+00	*	2.00E-05	I	2.00E-05	*	0.14
Pyrene	129-00-0	*******		*******		3.00E-02	I	3.00E-02	*	0
Selenium	7782-49-2	*******		*******		5.00E-03	I	*******		0
Silver	7440-22-4	*******		*******		5.00E-03	I	*******		0
Styrene	100-42-5	*******		*******		2.00E-01	I	2.86E-01	I	0
Tetrachlorobenzene,1,2,4,5-	95-94-3	*******		*******		3.00E-04	I	3.00E-04	*	0.1
Tetrachloroethane,1,1,1,2-	630-20-6	2.60E-02	I	2.59E-02	I	3.00E-02	I	3.00E-02	*	0
Tetrachloroethane,1,1,2,2-	79-34-5	2.00E-01	I	2.03E-01	I	6.00E-02	E	6.00E-02	*	0
Tetrachloroethylene	127-18-4	5.20E-02	E	2.03E-03	E	1.00E-02	I	1.10E-01	E	0
Tetrachlorophenol,2,3,4,6-	58-90-2	*******		*******		3.00E-02	I	3.00E-02	*	0.1
Thallium	7440-28-0	*******		*******		7.00E-05	H	*******		0
Toluene	108-88-3	*******		*******		2.00E-01	I	1.14E-01	I	0
Toxaphene	8001-35-2	1.10E+00	I	1.12E+00	I	*******		*******		0.1
Trichlorobenzene,1,2,4-	120-82-1	*******		*******		1.00E-02	I	5.70E-02	H	0
Trichloroethane,1,1,1-	71-55-6	*******		*******		3.50E-02	E	2.86E-01	E	0
Trichloroethane,1,1,2-	79-00-5	5.70E-02	I	5.60E-02	I	4.00E-03	I	4.00E-03	*	0
Trichloroethene	79-01-6	4.00E-01	E	4.00E-01	E	3.00E-04	E	1.14E-02	E	0
Trichlorofluoromethane	75-69-4	*******		*******		3.00E-01	I	2.00E-01	A	0
Trichlorophenol,2,4,5-	95-95-4	*******		*******		1.00E-01	I	1.00E-01	*	0.1
Trichlorophenol,2,4,6-	88-06-2	1.10E-02	I	1.10E-02	I	*******		*******		0.1
Vanadium	7440-62-2	*******		*******		7.00E-03	H	*******	*	0
Vinyl chloride	75-01-4	1.40E+00	I	3.10E-02	I	3.00E-03	I	2.90E-02	I	0
Xylene(mixed)	1330-20-7	*******		*******		2.00E-01	I	2.90E-02	I	0
Zinc	7440-66-6	*******		*******		3.00E-01	I	3.00E-01	*	0

NOTE: See end of Table for designation of letters and symbols.

COMPOUND	CAS #	SF_o	REF	SF_i	REF	RfD_o	REF	RfD_i	REF	ABS
		$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$		mg/kg-day		mg/kg-day		unitless
Aliphatics C6-C8	NA	*******		*******		5.00E+00	T	5.30E+00	T	0
Aliphatics >C8-C10	NA	*******		*******		1.00E-01	T	2.90E-01	T	0
Aliphatics >C10-C12	NA	*******		*******		1.00E-01	T	3.00E-01	T	0
Aliphatics >C12-C16	NA	*******		*******		1.00E-01	T	3.00E-01	T	0
Aliphatics >C16-C35	NA	*******		*******		2.00E+00	T	2.00E+00	*	0.1
Aromatics >C8-C10	NA	*******		*******		4.00E-02	T	6.00E-02	T	0
Aromatics >C10-C12	NA	*******		*******		4.00E-02	T	6.00E-02	T	0
Aromatics >C12-C16	NA	*******		*******		4.00E-02	T	6.00E-02	T	0
Aromatics >C16-C21	NA	*******		*******		3.00E-02	T	3.00E-02	*	0.1
Aromatics >C21-C35	NA	*******		*******		3.00E-02	T	3.00E-02	*	0.1

I = Integrated Risk Information System (IRIS), EPA.
H = Health Effects Assessment Summary Tables (HEAST), EPA.
A = Health Effects Assessment Summary Tables Alternative, EPA Region III Risk-Based Concentration Table.
E = EPA-NCEA Regional Support provisional value, EPA Region III Risk-Based Concentration Table.
* = Inhalation toxicity not available, oral toxicity value used to assess inhalation exposure.
# = Oral toxicity value not available, inhalation toxicity value used to assess oral exposure.
O = EPA Region III Risk-Based Concentration Table.
W = Withdrawn from IRIS or HEAST.
T = TPH Criteria Working Group, 1997.
IEUBK = refer to IEUBK model guidelines.
D= Dermal RfD for cadmium is 2.5E-05 mg/kg-d (based on an oral absorption efficiency of 5%; RAGS-E, EPA 1999).
S = Surrogate (Acenaphthene for Acenaphthylene; Naphthalene for Methylnaphthalene, 2-; Anthracene for Phenanthrene) .

COMPOUND	CAS #	MOL. WT	Koc	REF	H	REF	Da	REF	Dw	REF	S	REF
		g/g-mole	cm3/g		atm-m3/mol		cm2/s		cm2/s		mg/L	
Acenaphthene	83-32-9	154.2	4.90E+03	1	1.55E-04	1	4.21E-02	1	7.69E-06	1	4.24E+00	1
Acenaphthylene	208-96-8	152.2	2.00E+03	2	1.14E-04	2	4.39E-02	3	7.53E-06	3	1.60E+01	2
Acetone	67-64-1	58.08	5.75E-01	1	3.88E-05	1	1.24E-01	1	1.14E-05	1	1.00E+06	1
Aldrin	309-00-2	364.91	4.87E+04	1	1.70E-04	1	1.32E-02	1	4.86E-06	1	1.80E-01	1
Aniline	62-53-3	93.13	2.57E+01	5	1.90E-06	2	7.00E-02	3	8.30E-06	3	3.60E+04	2
Anthracene	120-12-7	178.23	2.35E+04	1	6.50E-05	1	3.24E-02	1	7.74E-06	1	4.30E-02	1
Antimony	7440-36-0	121.75	********	********	********	********	********	********	********	********	********	*******
Arsenic	7440-38-2	74.92	********	********	********	********	********	********	********	********	********	*******
Barium	7440-39-3	137.33	********	********	********	********	********	********	********	********	********	*******
Benzene	71-43-2	78.11	6.17E+01	1	5.55E-03	1	8.80E-02	1	9.80E-06	1	1.75E+03	1
Benz(a)anthracene	56-55-3	228.29	3.58E+05	1	3.35E-06	1	5.10E-02	1	9.00E-06	1	9.40E-03	1
Benzo(a)pyrene	50-32-8	252.32	9.69E+05	1	1.13E-06	1	4.30E-02	1	9.00E-06	1	1.60E-03	1
Benzo(b)fluoranthene	205-99-2	252.32	1.23E+06	1	1.11E-04	1	2.26E-02	1	5.56E-06	1	1.50E-03	1
Benzo(k)fluoranthene	207-08-9	252.32	1.23E+06	1	8.29E-07	1	2.26E-02	1	5.56E-06	1	8.00E-04	1
Beryllium	7440-41-7	9.01	********	********	********	********	********	********	********	********	********	*******
Biphenyl,1,1-	92-52-4	154.21	5.13E+03	5	3.00E-04	2	4.04E-02	9	8.15E-06	E	7.50E+00	2
Bis(2-chloroethyl)ether	111-44-4	143.01	7.59E+01	1	1.80E-05	1	6.92E-02	1	7.53E-06	1	1.70E+04	1
Bis(2-chloroisopropyl)ether	108-60-1	171.04	6.17E+01	4	1.13E-04	4	5.95E-02	E	6.62E-06	E	1.70E+03	4
Bis(2-ethyl-hexyl)phthalate	117-81-7	390.56	1.10E+05	1	1.02E-07	1	3.51E-02	1	3.66E-06	1	3.40E-01	1
Bromodichloromethane	75-27-4	163.83	5.50E+01	1	1.60E-03	1	2.98E-02	1	1.06E-05	1	6.70E+03	1
Bromoform	75-25-2	252.73	1.26E+02	1	5.35E-04	1	1.49E-02	1	1.03E-05	1	3.10E+03	1
Bromomethane	74-83-9	94.94	9.00E+00	1	6.20E-03	2	7.28E-02	3	1.21E-05	3	1.50E+04	2
Butyl benzyl phthalate	85-68-7	312.37	1.37E+04	1	1.26E-06	1	1.74E-02	1	4.83E-06	1	2.70E+00	1
Cadmium	7440-43-9	112.41	********	********	********	********	********	********	********	********	********	*******
Carbon Disulfide	75-15-0	76.14	4.57E+01	1	3.03E-02	1	1.04E-01	1	1.00E-05	1	1.19E+03	1
Carbon Tetrachloride	56-23-5	153.82	1.52E+02	1	3.04E-02	1	7.80E-02	1	8.80E-06	1	7.93E+02	1
Chlordane	57-74-9	409.78	5.13E+04	1	4.86E-05	1	1.18E-02	1	4.37E-06	1	5.60E-02	1
Chloroaniline,p-	106-47-8	127.57	6.61E+01	1	3.31E-07	1	4.83E-02	1	1.01E-05	1	5.30E+03	1
Chlorobenzene	108-90-7	112.56	2.24E+02	1	3.70E-03	1	7.30E-02	1	8.70E-06	1	4.72E+02	1
Chlorodibromomethane	124-48-1	208.28	6.31E+01	1	7.83E-04	1	1.96E-02	1	1.05E-05	1	2.60E+03	1
Chloroethane (Ethylchloride)	75-00-3	64.51	3.24E+00	4	8.80E-03	2	2.71E-01	E	1.15E-05	E	5.70E+03	2
Chloroform	67-66-3	119.38	5.25E+01	1	3.67E-03	1	1.04E-01	1	1.00E-05	1	7.92E+03	1
Chloromethane	74-87-3	50.49	2.51E+01	4	8.80E-03	2	1.26E-01	E	6.50E-06	E	5.30E+03	1
Chloronaphthalene,2-	91-58-7	162.62	8.51E+03	4	3.10E-04	2	3.47E-02	3	8.80E-06	3	1.20E+01	2

NOTE: See end of Table for designation of numbers and letter.

COMPOUND	CAS #	MOL. WT	Koc	REF	H	REF	Da	REF	Dw	REF	S	REF
		g/g-mole	cm3/g		atm-m3/mol		cm2/s		cm2/s		mg/L	
Chlorophenol,2-	95-57-8	128.56	3.63E+02	4	3.91E-04	1	5.01E-02	1	9.46E-06	1	2.20E+04	1
Chromium(III)	16065-83-1	52	********	********	********	********	********	********	********	********	********	*******
Chromium(VI)	18540-29-97	52	********	********	********	********	********	********	********	********	********	*******
Chrysene	218-01-9	228.29	3.98E+05	1	9.46E-05	1	2.48E-02	1	6.21E-06	1	1.60E-03	1
Cobalt	7440-48-4	58.93	********	********	********	********	********	********	********	********	********	*******
Copper	7440-50-8	63.55	********	********	********	********	********	********	********	********	********	*******
Cyanide (free)	57-12-5	26.01	********	********	********	********	********	********	********	********	********	*******
DDD	72-54-8	320.04	4.58E+04	1	4.00E-06	1	1.69E-02	1	4.76E-06	1	9.00E-02	1
DDE	72-55-9	318.03	8.64E+04	1	2.10E-05	1	1.44E-02	1	5.87E-06	1	1.20E-01	1
DDT	50-29-3	354.49	6.78E+05	1	8.10E-06	1	1.37E-02	1	4.95E-06	1	2.50E-02	1
Dibenz(a,h)anthracene	53-70-3	278.35	1.79E+06	1	1.47E-08	1	2.02E-02	1	5.18E-06	1	2.50E-03	1
Dibenzofuran	132-64-9	168.19	8.13E+03	4	1.30E-05	2	2.67E-02	3	6.00E-06	3	3.10E+00	2
Dibromo-3-chloropropane,1,2-	96-12-8	236.33	8.80E+01	E	1.50E-04	2	2.12E-02	3	7.00E-06	3	1.20E+03	2
Dichlorobenzene,1,2-	95-50-1	147	3.79E+02	1	1.90E-03	1	6.90E-02	1	7.90E-06	1	1.56E+02	1
Dichlorobenzene,1,3-	541-73-1	147	1.70E+03	4	3.30E-03	2	6.42E-02	E	7.10E-06	E	1.30E+02	2
Dichlorobenzene,1,4-	106-46-7	147	6.16E+02	1	2.43E-03	1	6.90E-02	1	7.90E-06	1	7.38E+01	1
Dichlorobenzidine,3,3-	91-94-1	253.13	7.24E+02	1	4.00E-09	1	1.94E-02	1	6.74E-06	1	3.10E+00	1
Dichloroethane,1,1-	75-34-3	98.96	5.34E+01	1	5.62E-03	1	7.42E-02	1	1.05E-05	1	5.06E+03	1
Dichloroethane,1,2-	107-06-2	98.96	3.80E+01	1	9.79E-04	1	1.04E-01	1	9.90E-06	1	8.52E+03	1
Dichloroethene,1,1-	75-35-4	96.94	6.50E+01	1	2.61E-02	1	9.00E-02	1	1.04E-05	1	2.25E+03	1
Dichloroethene,cis,1,2-	156-59-2	96.94	3.55E+01	1	4.08E-03	1	7.36E-02	1	1.13E-05	1	3.50E+03	1
Dichloroethene,trans,1,2-	156-60-5	96.94	3.80E+01	1	9.38E-03	1	7.07E-02	E	1.19E-05	E	6.30E+03	1
Dichlorophenol,2,4-	120-83-2	163	8.71E+02	4	3.16E-06	1	3.46E-02	1	8.77E-06	1	4.50E+03	1
Dichloropropane,1,2-	78-87-5	112.99	4.70E+01	1	2.80E-03	1	7.82E-02	1	8.73E-06	1	2.80E+03	1
Dichloropropene,1,3-	542-75-6	110.98	4.57E+01	1	1.77E-03	1	6.26E-02	1	1.00E-05	1	2.80E+03	1
Dieldrin	60-57-1	380.91	2.55E+04	1	1.51E-05	1	1.25E-02	1	4.74E-06	1	1.95E-01	1
Diethylphthalate	84-66-2	222.24	8.22E+01	1	4.50E-07	1	2.56E-02	1	6.35E-06	1	1.08E+03	1
Dimethylphenol,2,4-	105-67-9	122.17	2.09E+02	1	2.00E-06	1	5.84E-02	1	8.69E-06	1	7.87E+03	1
Dimethylphthalate	131-11-3	194.19	4.26E+01	4	1.10E-07	2	5.68E-02	3	6.30E-06	3	4.00E+03	2
Di-n-octylphthalate	117-84-0	390.56	8.32E+07	1	6.68E-05	1	1.51E-02	1	3.58E-06	1	2.00E-02	1
Dinitrobenzene,1,3-	99-65-0	168.11	1.51E+02	5	3.70E-07	2	2.79E-01	3	9.10E-06	3	5.30E+02	2
Dinitrophenol,2,4-	51-28-5	184.11	1.78E+01	4	4.43E-07	1	2.73E-02	1	9.06E-06	1	2.79E+03	1
Dinitrotoluene,2,6-	606-20-2	182.14	6.92E+01	1	7.47E-07	1	3.27E-02	1	7.26E-06	1	1.82E+02	1
Dinitrotoluene,2,4-	121-14-2	182.14	9.55E+01	1	9.26E-08	1	2.03E-01	1	7.06E-06	1	2.70E+02	1

NOTE: See end of Table for designation of numbers and letter.

COMPOUND	CAS #	MOL. WT	Koc	REF	H	REF	Da	REF	Dw	REF	S	REF
		g/g-mole	cm3/g		atm-m3/mol		cm2/s		cm2/s		mg/L	
Dinoseb	88-85-7	240.22	1.24E+02	8	4.60E-07	2	5.00E-02	E	5.60E-06	E	5.20E+01	2
Endosulfan	115-29-7	406.93	2.04E+03	1	1.12E-05	1	1.15E-02	1	4.55E-06	1	5.10E-01	1
Endrin	72-20-8	380.93	1.08E+04	1	7.52E-06	1	1.25E-02	1	4.74E-06	1	2.50E-01	1
Ethyl benzene	100-41-4	106.17	2.04E+02	1	7.88E-03	1	7.50E-02	1	7.80E-06	1	1.69E+02	1
Fluoranthene	206-44-0	202.26	4.91E+04	1	1.61E-05	1	3.02E-02	1	6.35E-06	1	2.06E-01	1
Fluorene	86-73-7	166.22	7.71E+03	1	6.36E-05	1	3.63E-02	1	7.88E-06	1	1.98E+00	1
Heptachlor	76-44-8	373.32	9.53E+03	1	1.48E+00	1	1.12E-02	1	5.69E-06	1	1.80E-01	1
Heptachlor epoxide	1024-57-3	389.32	8.32E+04	1	9.50E-06	1	1.32E-02	1	4.23E-06	1	2.00E-01	1
Hexachlorobenzene	118-74-1	284.78	8.00E+04	1	1.32E-03	1	5.42E-02	1	5.91E-06	1	6.20E+00	1
Hexachlorobutadiene	87-68-3	260.76	5.37E+04	1	8.15E-03	1	5.61E-02	1	6.16E-06	1	3.23E+00	1
Hexachlorocyclohexane,alpha	319-84-6	290.83	1.76E+03	1	1.06E-05	1	1.42E-02	1	7.34E-06	1	2.00E+00	1
Hexachlorocyclohexane,beta	319-85-7	290.83	2.14E+03	1	7.43E-07	1	1.42E-02	1	7.34E-06	1	2.40E-01	1
Hexachlorocyclohexane,gamma	58-89-9	290.83	1.35E+03	1	1.40E-05	1	1.42E-02	1	7.34E-06	1	6.80E+00	1
Hexachlorocyclopentadiene	77-47-4	272.77	2.00E+05	1	2.70E-02	1	1.61E-02	1	7.21E-06	1	1.80E+00	1
Hexachloroethane	67-72-1	236.74	1.78E+03	1	3.89E-03	1	2.50E-03	1	6.80E-06	1	5.00E+00	1
Indeno(1,2,3-cd)pyrene	193-39-5	276.34	3.47E+06	1	1.60E-06	1	1.90E-02	1	5.66E-06	1	2.20E-05	1
Isobutyl alcohol	78-83-1	74.12	2.20E+00	1	1.20E-05	2	9.00E-02	E	1.00E-05	E	8.50E+04	2
Isophorone	78-59-1	138.21	4.68E+01	1	6.64E-06	1	6.23E-02	1	6.76E-06	1	1.20E+04	1
Lead (inorganic)	7439-92-1	207.2	********	********	********	********	********	********	********	********	********	*******
Mercury (inorganic)	7487-94-7	200.59	********	********	********	********	********	********	********	********	********	*******
Methoxychlor	72-43-5	345.65	8.00E+04	1	1.58E-05	1	1.56E-02	1	4.46E-06	1	4.50E-02	1
Methylene chloride	75-09-2	84.93	6.16E+00	1	2.19E-03	1	1.01E-01	1	1.17E-05	1	1.30E+04	1
Methyl ethyl ketone	78-93-3	72.11	1.23E+00	4	5.60E-05	2	8.08E-02	E	9.80E-06	E	2.20E+05	2
Methyl isobutyl ketone	108-10-1	100.16	6.20E+00	4	1.40E-04	2	7.50E-02	3	7.80E-06	3	1.90E+04	2
Methylnaphthalene,2-	91-57-6	142.2	2.24E+03	3	5.80E-05	3	4.80E-02	3	7.84E-06	3	2.46E+01	2
MTBE (methyl tert-butyl ether)	1634-04-4	83.1	1.12E+01	6	5.87E-04	6	1.02E-01	3	1.05E-05	3	5.10E+04	6
Naphthalene	91-20-3	128.17	1.19E+03	1	4.83E-04	1	5.90E-02	1	7.50E-06	1	3.10E+01	1
Nickel	7440-02-0	58.69	********	********	********	********	********	********	********	********	********	*******
Nitrate	14797-55-8	62	********	********	********	********	********	********	********	********	********	*******
Nitrite	14797-65-0	46	********	********	********	********	********	********	********	********	********	*******
Nitroaniline,2-	88-74-4	138.13	1.70E+01	4	9.72E-05	4	6.60E-02	E	7.40E-06	E	1.26E+03	4
Nitroaniline,3-	99-09-2	138.13	1.82E+01	4	1.47E-07	2	6.60E-02	E	7.40E-06	E	1.20E+03	2
Nitroaniline,4-	100-01-6	138.13	1.20E+01	4	2.10E-09	2	4.73E-02	E	8.58E-06	E	7.30E+02	2
Nitrobenzene	98-95-3	123.11	1.19E+02	1	2.40E-05	1	7.60E-02	1	8.60E-06	1	2.09E+03	1

NOTE: See end of Table for designation of numbers and letter.

COMPOUND	CAS #	MOL. WT	Koc	REF	H	REF	Da	REF	Dw	REF	S	REF
		g/g-mole	cm3/g		atm-m3/mol		cm2/s		cm2/s		mg/L	
Nitrophenol,4-	100-02-7	139.11	5.50E+01	4	4.20E-10	2	4.30E-02	3	9.60E-06	3	1.20E+04	2
Nitrosodi-n-propylamine,n-	621-64-7	130.19	2.40E+01	1	2.25E-06	1	5.45E-02	1	8.17E-06	1	9.89E+03	1
N-nitrosodiphenylamine	86-30-6	198.22	1.29E+03	1	5.00E-06	1	3.12E-02	1	6.35E-06	1	3.51E+01	1
Pentachlorophenol	87-86-5	266.34	8.91E+02	4	2.44E-08	1	5.60E-02	1	6.10E-06	1	1.95E+03	1
Phenanthrene	85-01-8	178.24	4.80E+03	2	2.33E-05	2	3.24E-02	E	7.74E-06	E	1.15E+00	2
Phenol	108-95-2	94.11	2.88E+01	1	3.97E-07	1	8.20E-02	1	9.10E-06	1	8.28E+04	1
Polychlorinated biphenyls	1336-36-3	290	3.09E+05	1	1.10E-03	2	4.56E-02	E	5.09E-06	E	3.10E-02	2
Pyrene	129-00-0	202.26	6.80E+04	1	1.10E-05	1	2.72E-02	1	7.24E-06	1	1.35E-01	1
Selenium	7782-49-2	78.96	********	********	********	********	********	********	********	********	********	*******
Silver	7440-22-4	107.87	********	********	********	********	********	********	********	********	********	*******
Styrene	100-42-5	104.15	9.12E+02	1	2.75E-03	1	7.10E-02	1	8.00E-06	1	3.10E+02	1
Tetrachlorobenzene,1,2,4,5-	95-94-3	215.89	5.25E+03	5	2.60E-03	2	2.11E-02	3	8.80E-06	3	6.00E-01	2
Tetrachloroethane,1,1,1,2-	630-20-6	167.85	5.40E+01	7	2.40E-03	7	6.00E-02	E	6.70E-06	E	1.10E+03	2
Tetrachloroethane,1,1,2,2-	79-34-5	167.85	7.90E+01	1	3.45E-04	1	7.10E-02	1	7.90E-06	1	2.97E+03	1
Tetrachloroethylene	127-18-4	165.83	2.65E+02	1	1.84E-02	1	7.20E-02	1	8.20E-06	1	2.00E+02	1
Tetrachlorophenol,2,3,4,6-	58-90-2	231.89	2.13E+02	1	4.40E-06	2	2.17E-02	1	7.10E-06	1	1.00E+03	2
Thallium	7440-28-0	204.38	********	********	********	********	********	********	********	********	********	*******
Toluene	108-88-3	92.14	1.40E+02	1	6.64E-03	1	8.70E-02	1	8.60E-06	1	5.26E+02	1
Toxaphene	8001-35-2	413.2	9.58E+04	1	6.00E-06	1	1.16E-02	1	4.34E-06	1	7.40E-01	1
Trichlorobenzene,1,2,4-	120-82-1	181.45	1.66E+03	1	1.42E-03	1	3.00E-02	1	8.23E-06	1	3.00E+02	1
Trichloroethane,1,1,1-	71-55-6	133.4	1.35E+02	1	1.72E-02	1	7.80E-02	1	8.80E-06	1	1.33E+03	1
Trichloroethane,1,1,2-	79-00-5	133.4	7.50E+01	1	9.13E-04	1	7.80E-02	1	8.80E-06	1	4.42E+03	1
Trichloroethene	79-01-6	131.39	9.43E+01	1	1.03E-02	1	7.90E-02	1	9.10E-06	1	1.10E+03	1
Trichlorofluoromethane	75-69-4	137.37	1.59E+02	4	9.70E-02	2	8.70E-02	3	9.70E-06	3	1.10E+03	2
Trichlorophenol,2,4,5-	95-95-4	197.45	7.08E+02	4	4.33E-06	1	2.91E-02	1	7.03E-06	1	1.20E+03	1
Trichlorophenol,2,4,6-	88-06-2	197.45	1.07E+03	4	7.80E-06	1	3.18E-02	1	6.25E-06	1	8.00E+02	1
Vanadium	7440-62-2	50.94	********	********	********	********	********	********	********	********	********	*******
Vinyl chloride	75-01-4	62.5	1.86E+01	1	2.70E-02	1	1.06E-01	1	1.23E-06	1	2.76E+03	1
Xylene(mixed)	1330-20-7	106.17	1.29E+02	4	7.60E-03	1	7.00E-02	1	7.80E-06	1	1.60E+02	1
Zinc	7440-66-6	65.38	********	********	********	********	********	********	********	********	********	*******
Aliphatics C6-C8	NA	100	3.98E+03	10	1.22E+00	10	1.00E-01	10	1.00E-05	10	********	*******
Aliphatics >C8-C10	NA	130	3.16E+04	10	1.95E+00	10	1.00E-01	10	1.00E-05	10	********	*******
Aliphatics >C10-C12	NA	160	2.51E+05	10	2.93E+00	10	1.00E-01	10	1.00E-05	10	********	*******
Aliphatics >C12-C16	NA	200	5.01E+06	10	1.27E+01	10	1.00E-01	10	1.00E-05	10	********	*******

NOTE: See end of Table for designation of numbers and letter.

COMPOUND	CAS #	MOL. WT	Koc	REF	H	REF	Da	REF	Dw	REF	S	REF
		g/g-mole	cm3/g		atm-m3/mol		cm2/s		cm2/s		mg/L	
Aliphatics >C16-C35	NA	270	6.31E+08	10	1.20E+02	10	1.00E-01	10	1.00E-05	10	********	*******
Aromatics >C8-C10	NA	120	1.58E+03	10	1.17E-02	10	1.00E-01	10	1.00E-05	10	********	*******
Aromatics >C10-C12	NA	130	2.51E+03	10	3.41E-03	10	1.00E-01	10	1.00E-05	10	********	*******
Aromatics >C12-C16	NA	150	5.01E+03	10	1.29E-03	10	1.00E-01	10	1.00E-05	10	********	*******
Aromatics >C16-C21	NA	190	1.58E+04	10	3.17E-04	10	1.00E-01	10	1.00E-05	10	********	*******
Aromatics >C21-C35	NA	240	1.26E+05	10	1.63E-05	10	1.00E-01	10	1.00E-05	10	********	*******

* If data on more than one isomer is available; then used most protective. If data available on only one isomer; then used that data.

1. Soil Screening Guidance, 1996.
2. Superfund Chemical Data Matrix, June 1996.
3. Air Emissions Models for Waste and Wastewater, EPA-453/R-94-080A, 1994.
4. Groundwater Chemicals Desk Reference, Montgomery, J. H., et.al., 1990.
5. Groundwater Chemicals Desk Reference, vol. II, Montgomery, J. H., et.al., 1991.
6. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, vol. IV, 1991.
7. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, vol. II, 1991.
8. Soil Chemistry of Hazardous Materials, 1988.
9. CHEMDAT 8, November, 1994.
10. Total Petroleum Hydrocarbon Criteria Workgroup, 1996.

E - Estimated.

LDEQ RECAP
APPENDIX H
TABLE H-4
QUANTITATION LIMITS USED IN RECAP

COMPOUND	Soil	GW
	mg/kg	mg/l
Acenaphthene		1.0E-02
Acenaphthylene		
Acetone		1.0E-01
Aldrin		1.9E-03
Aniline		1.0E-02
Anthracene		1.0E-02
Antimony		
Arsenic		
Barium		
Benzene		
Benz(a)anthracene		7.8E-03
Benzo(a)pyrene	3.3E-01	
Benzo(b)fluoranthene		4.8E-03
Benzo(k)fluoranthene		2.5E-03
Beryllium		
Biphenyl,1,1-		1.0E-04
Bis(2-chloroethyl)ether	3.3E-01	5.7E-03
Bis(2-chloroisopropyl)ether	8.0E-01	5.7E-03
Bis(2-ethyl-hexyl)phthalate		
Bromodichloromethane		
Bromoform		
Bromomethane		1.0E-02
Butyl benzyl phthalate		1.0E-02
Cadmium		
Carbon Disulfide		5.0E-03
Carbon Tetrachloride		
Chlordane		
Chloroaniline,p-		2.0E-02
Chlorobenzene		
Chlorodibromomethane		
Chloroethane (Ethylchloride)		1.0E-02
Chloroform		
Chloromethane	1.0E-01	1.0E-02
Chloronaphthalene,2-		1.0E-02
Chlorophenol,2-		1.0E-02
Chromium(III)		
Chromium(VI)		
Chrysene		1.5E-03
Cobalt		
Copper		
Cyanide (free)		
DDD		1.2E-05
DDE		5.0E-05
DDT		3.0E-04
Dibenz(a,h)anthracene	3.3E-01	2.5E-03
Dibenzofuran		1.0E-02
Dibromo-3-chloropropane,1,2-	1.0E-02	
Dichlorobenzene,1,2-		

LDEQ RECAP
APPENDIX H
TABLE H-4
QUANTITATION LIMITS USED IN RECAP

COMPOUND	Soil	GW
	mg/kg	mg/l
Dichlorobenzene,1,3-		1.0E-02
Dichlorobenzene,1,4-		
Dichlorobenzidine,3,3-		2.0E-02
Dichloroethane,1,1-		5.0E-03
Dichloroethane,1,2-		
Dichloroethene,1,1-		
Dichloroethene,cis,1,2-		
Dichloroethene,trans,1,2-		
Dichlorophenol,2,4-		1.0E-02
Dichloropropane,1,2-		
Dichloropropene,1,3-		5.0E-03
Dieldrin		2.5E-03
Diethylphthalate		1.0E-02
Dimethylphenol,2,4-		1.0E-02
Dimethylphthalate		1.0E-02
Di-n-octylphthalate		2.5E-03
Dinitrobenzene,1,3-	2.5E-01	1.0E-02
Dinitrophenol,2,4-	1.7E+00	5.0E-02
Dinitrotoluene,2,6-		1.0E-02
Dinitrotoluene,2,4-		1.0E-02
Dinoseb	1.4E-01	
Endosulfan		1.2E-04
Endrin		
Ethyl benzene		
Fluoranthene		1.0E-02
Fluorene		1.0E-02
Heptachlor		
Heptachlor epoxide		
Hexachlorobenzene	3.3E-01	
Hexachlorobutadiene		6.0E-04
Hexachlorocyclohexane,alpha		3.0E-05
Hexachlorocyclohexane,beta		6.0E-05
Hexachlorocyclohexane,gamma		
Hexachlorocyclopentadiene		
Hexachloroethane		1.0E-02
Indeno(1,2,3-cd)pyrene		3.7E-03
Isobutyl alcohol		
Isophorone		1.0E-02
Lead (inorganic)		
Mercury (inorganic)		
Methoxychlor		
Methylene chloride		
Methyl ethyl ketone		1.0E-01
Methyl isobutyl ketone		5.0E-02
Methylnaphthalene,2-		
MTBE (methyl tert-butyl ether)		
Naphthalene		1.0E-02
Nickel		1.5E-02

LDEQ RECAP
APPENDIX H
TABLE H-4
QUANTITATION LIMITS USED IN RECAP

COMPOUND	Soil	GW
	mg/kg	mg/l
Nitrate		
Nitrite		
Nitroaniline,2-	1.7E+00	5.0E-02
Nitroaniline,3-	1.7E+00	5.0E-02
Nitroaniline,4-	1.7E+00	5.0E-02
Nitrobenzene	3.3E-01	1.9E-03
Nitrophenol,4-		5.0E-02
Nitrosodi-n-propylamine,n-	3.3E-01	1.0E-02
N-nitrosodiphenylamine		1.0E-02
Pentachlorophenol	1.7E+00	
Phenanthrene		
Phenol		1.0E-02
Polychlorinated biphenyls		
Pyrene		1.0E-02
Selenium		
Silver		7.0E-03
Styrene		
Tetrachlorobenzene,1,2,4,5-		
Tetrachloroethane,1,1,1,2-		5.0E-03
Tetrachloroethane,1,1,2,2-		5.0E-04
Tetrachloroethylene		
Tetrachlorophenol,2,3,4,6-		
Thallium		
Toluene		
Toxaphene		
Trichlorobenzene,1,2,4-		
Trichloroethane,1,1,1-		
Trichloroethane,1,1,2-		
Trichloroethene		
Trichlorofluoromethane		
Trichlorophenol,2,4,5-		1.0E-02
Trichlorophenol,2,4,6-		1.0E-02
Vanadium		
Vinyl chloride		
Xylene(mixed)		
Zinc		2.0E-02
Aliphatics C6-C8		1.5E-01
Aliphatics >C8-C10		1.5E-01
Aliphatics >C10-C12		1.5E-01
Aliphatics >C12-C16		1.5E-01
Aliphatics >C16-C35		1.5E-01
Aromatics >C8-C10		1.5E-01
Aromatics >C10-C12		1.5E-01
Aromatics >C12-C16		1.5E-01
Aromatics >C16-C21		1.5E-01
Aromatics >C21-C35		1.5E-01

Soil properties		Management Option 2							
Revision Date: 08/04/2003									
Run date:	10/17/2003								
*****calculation inputs*****									
1.7	g/cm3		pb = dry soil bulk density						
0.358491	Lpore/Lsoil		n = total soil porosity						
0.21	Lwater/Lsoil		nw = water-filled soil porosity						
0.148491	Lair/Lsoil		na = air-filled soil porosity						
2.65	g/cm3		ps = soil particle density						
0.006	g/g		foc = fractional organic carbon in soil						
148	(ft) = L = length of the source at the water table								
148	(ft) = W = width of impacted area perpendicular to flow direction of aquifer								
0.5	Acres		AOI site area - input into Q/C equation below						
76.30616	g/m2-s per kg/m3		Q/C = inverse of mean concentration at center of square source						
Q/C Table									
site size	148*148	209*209	295*295	467*467	660*660	1143*1143			
site size	0.5 acre	1 acre	2 acre	5 acre	10 acre	30 acre			
Q/C value	76.3062	67.4304	59.872	51.4648	46.1707	39.2329			

Sd eqn & Summer's Model DAF							
Revision Date: 08/04/2003							
Run date:	10/17/2003						
Sd = hadv + hdisp = thickness of the mixing zone							
15.6	(ft)						
hadv = B*[1 - exp((-I*L)/(B*Dv))]							
0.81	(ft) = hadv = advective component of the plume depth						
0.33	(ft/ft) = I = infiltration rate						
60.00	(ft/yr) = Dv = horizontal Darcy velocity						
20.00	(ft) = B = thickness of the shallow water bearing zone						
148.00	(ft) = L = length of the source at the water table						
hdisp = (2*Az*L)							
14.80	(ft) = hdisp = dispersive component of the plume depth						
0.74	(ft) = Az = vertical dispersivity						
148.00	(ft) = L = length of the source at the water table						
Summer's Model DAF							
DAF = Cl/Cgw = (Qa+Qp)/Qp							
20.0	unitless						
Qa = Dv*Sd*W							
138577	(ft3/yr) = Qa = volumetric flow rate of groundwater						
60.00	(ft/yr) = Dv = horizontal Darcy velocity						
15.61	(ft) = Sd = hadv + hdisp = thickness of the mixing zone						
148.00	(ft) = W = width of impacted area perpendicular to flow direction of aquifer						
Qp = I*A							
7301.33	(ft3/yr) = Qp = volumetric flow rate of infiltration (soil pore water) into the aquifer						
0.33	(ft/yr) = I = infiltration rate						
21904.00	(ft2) = A = area of the source						
Max DF Domenico		440					
(for use with SoilGW and GW values)							

LDEQ RECAP
WORKSHEET 1
GW 1 AND 2
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/17/2003

C(mg/l)-Vol GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

COMPOUND	**MCL (mg/l)**	**C(mg/l)-V**	**C(mg/l)-NV**	**N(mg/l)-V**	**N(mg/l)-NV**	**MCL or min value (C or N)**	**GW1 (mg/l)**		**GW2 (mg/l)**		**FOR CAL SOILGW1**	**FOR CAL SOILGW2**
Acenaphthene		NA		3.65E-01		3.7E-01	3.7E-01	N	3.7E-01	X DF 2	3.7E-01	3.7E-01
Acenaphthylene		NA		3.65E-01		3.7E-01	3.7E-01	N	3.7E-01	X DF 2	3.7E-01	3.7E-01
Acetone		NA		6.08E-01		6.1E-01	6.1E-01	N	6.1E-01	X DF 2	6.1E-01	6.1E-01
Aldrin			3.90E-06		1.10E-03	3.9E-06	1.9E-03	Q	1.9E-03	F	1.9E-03	1.9E-03
Aniline			1.16E-02		2.56E-01	1.2E-02	1.2E-02	C	1.2E-02	X DF 2	1.2E-02	1.2E-02
Anthracene		NA		1.83E+00		1.8E+00	1.8E+00	N	1.8E+00	X DF 2	4.3E-02	4.3E-02
Antimony	6.00E-03		NA		1.46E-02	6.0E-03	6.0E-03	MCL	6.0E-03	X DF 2	6.0E-03	6.0E-03
Arsenic	1.00E-02		4.42E-05		1.10E-02	1.0E-02	1.0E-02	MCL	1.0E-02	X DF 2	1.0E-02	1.0E-02
Barium	2.00E+00		NA		2.56E+00	2.0E+00	2.0E+00	MCL	2.0E+00	X DF 2	2.0E+00	2.0E+00
Benzene	5.00E-03	3.81E-04		4.39E-02		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Benz(a)anthracene			9.09E-05		NA	9.1E-05	7.8E-03	Q	9.1E-05	X DF 2	7.8E-03	9.1E-05
Benzo(a)pyrene	2.00E-04		9.09E-06		NA	2.0E-04	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	2.0E-04
Benzo(b)fluoranthene			9.09E-05		NA	9.1E-05	4.8E-03	Q	9.1E-05	X DF 2	1.5E-03	9.1E-05
Benzo(k)fluoranthene			9.09E-04		NA	9.1E-04	2.5E-03	Q	9.1E-04	X DF 2	8.0E-04	8.0E-04
Beryllium	4.00E-03		NA		7.30E-02	4.0E-03	4.0E-03	MCL	4.0E-03	X DF 2	4.0E-03	4.0E-03
Biphenyl,1,1-		NA		3.04E-01		3.0E-01	3.0E-01	N	3.0E-01	X DF 2	3.0E-01	3.0E-01
Bis(2-chloroethyl)ether		9.62E-06		NA		9.6E-06	5.7E-03	Q	5.7E-03	F	5.7E-03	5.7E-03
Bis(2-chloroisopropyl)ether		2.71E-04		2.43E-01		2.7E-04	5.7E-03	Q	2.7E-04	X DF 2	5.7E-03	2.7E-04
Bis(2-ethyl-hexyl)phthalate	6.00E-03		4.74E-03		7.30E-01	6.0E-03	6.0E-03	MCL	6.0E-03	X DF 2	6.0E-03	6.0E-03
Bromodichloromethane	1.00E-01	1.78E-04		1.22E-01		1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Bromoform	1.00E-01	2.44E-03		1.22E-01		1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Bromomethane		NA		8.67E-03		8.7E-03	1.0E-02	Q	8.7E-03	X DF 2	1.0E-02	8.7E-03
Butyl benzyl phthalate			NA		7.30E+00	7.3E+00	7.3E+00	N	7.3E+00	X DF 2	2.7E+00	2.7E+00
Cadmium	5.00E-03		NA		1.83E-02	5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03

LDEQ RECAP
WORKSHEET 1
GW 1 AND 2
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/17/2003

C(mg/l)-Vol GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

						MCL or						
	MCL					**min value**	**GW1**		**GW2**		**FOR CAL**	**FOR CAL**
COMPOUND	**(mg/l)**	**C(mg/l)-V**	**C(mg/l)-NV**	**N(mg/l)-V**	**N(mg/l)-NV**	**(C or N)**	**(mg/l)**		**(mg/l)**		**SOILGW1**	**SOILGW2**
Carbon Disulfide		NA		1.04E+00		1.0E+00	1.0E+00	N	1.0E+00	X DF 2	1.0E+00	1.0E+00
Carbon Tetrachloride	5.00E-03	1.69E-04		3.58E-03		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Chlordane	2.00E-03		1.90E-04		1.83E-02	2.0E-03	2.0E-03	MCL	2.0E-03	X DF 2	2.0E-03	2.0E-03
Chloroaniline,p-			NA		1.46E-01	1.5E-01	1.5E-01	N	1.5E-01	X DF 2	1.5E-01	1.5E-01
Chlorobenzene	1.00E-01	NA		1.06E-01		1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Chlorodibromomethane	1.00E-01	1.32E-04		1.22E-01		1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Chloroethane (Ethylchloride)		3.81E-03		8.59E+00		3.8E-03	1.0E-02	Q	3.8E-03	X DF 2	1.0E-02	3.8E-03
Chloroform	1.00E-01	1.62E-04		6.27E-04		1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Chloromethane		1.49E-03		5.23E-01		1.5E-03	1.0E-02	Q	1.5E-03	X DF 2	1.0E-02	1.5E-03
Chloronaphthalene,2-		NA		4.87E-01		4.9E-01	4.9E-01	N	4.9E-01	X DF 2	4.9E-01	4.9E-01
Chlorophenol,2-		NA		3.04E-02		3.0E-02	3.0E-02	N	3.0E-02	X DF 2	3.0E-02	3.0E-02
Chromium(III)	1.00E-01		NA		5.48E+01	1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Chromium(VI)	1.00E-01		NA		1.10E-01	1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Chrysene			9.09E-03		NA	9.1E-03	9.1E-03	C	9.1E-03	X DF 2	1.6E-03	1.6E-03
Cobalt			NA		2.19E+00	2.2E+00	2.2E+00	N	2.2E+00	X DF 2	2.2E+00	2.2E+00
Copper	1.30E+00		NA		1.46E+00	1.3E+00	1.3E+00	MCL	1.3E+00	X DF 2	1.3E+00	1.3E+00
Cyanide (free)	2.00E-01		NA		7.30E-01	2.0E-01	2.0E-01	MCL	2.0E-01	X DF 2	2.0E-01	2.0E-01
DDD			2.77E-04		NA	2.8E-04	2.8E-04	C	2.8E-04	X DF 2	2.8E-04	2.8E-04
DDE			1.95E-04		NA	2.0E-04	2.0E-04	C	2.0E-04	X DF 2	2.0E-04	2.0E-04
DDT			1.95E-04		1.83E-02	2.0E-04	3.0E-04	Q	2.0E-04	X DF 2	3.0E-04	2.0E-04
Dibenz(a,h)anthracene			9.09E-06		NA	9.1E-06	2.5E-03	Q	9.1E-06	X DF 2	2.5E-03	9.1E-06
Dibenzofuran		NA		2.43E-02		2.4E-02	2.4E-02	N	2.4E-02	X DF 2	2.4E-02	2.4E-02
Dibromo-3-chloropropane,1,2-	2.00E-04		4.74E-05		2.08E-03	2.0E-04	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	2.0E-04
Dichlorobenzene,1,2-	6.00E-01	NA		3.69E-01		6.0E-01	6.0E-01	MCL	6.0E-01	X DF 2	6.0E-01	6.0E-01

LDEQ RECAP
WORKSHEET 1
GW 1 AND 2
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/17/2003

C(mg/l)-Vol GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

COMPOUND	MCL (mg/l)	C(mg/l)-V	C(mg/l)-NV	N(mg/l)-V	N(mg/l)-NV	MCL or min value (C or N)	GW1 (mg/l)		GW2 (mg/l)		FOR CAL SOILGW1	FOR CAL SOILGW2
Dichlorobenzene,1,3-		NA		5.48E-03		5.5E-03	1.0E-02	Q	5.5E-03	X DF 2	1.0E-02	5.5E-03
Dichlorobenzene,1,4-	7.50E-02	4.61E-04		6.62E-01		7.5E-02	7.5E-02	MCL	7.5E-02	X DF 2	7.5E-02	7.5E-02
Dichlorobenzidine,3,3-			1.47E-04		NA	1.5E-04	2.0E-02	Q	1.5E-04	X DF 2	2.0E-02	1.5E-04
Dichloroethane,1,1-		NA		8.12E-01		8.1E-01	8.1E-01	N	8.1E-01	X DF 2	8.1E-01	8.1E-01
Dichloroethane,1,2-	5.00E-03	1.22E-04		1.77E-02		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Dichloroethene,1,1-	7.00E-03	NA		3.39E-01		7.0E-03	7.0E-03	MCL	7.0E-03	X DF 2	7.0E-03	7.0E-03
Dichloroethene,cis,1,2-	7.00E-02	NA		6.08E-02		7.0E-02	7.0E-02	MCL	7.0E-02	X DF 2	7.0E-02	7.0E-02
Dichloroethene,trans,1,2-	1.00E-01	NA		1.22E-01		1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Dichlorophenol,2,4-			NA		1.10E-01	1.1E-01	1.1E-01	N	1.1E-01	X DF 2	1.1E-01	1.1E-01
Dichloropropane,1,2-	5.00E-03	1.63E-04		6.94E-03		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Dichloropropene,1,3-		3.90E-04		4.02E-02		3.9E-04	5.0E-03	Q	3.9E-04	X DF 2	5.0E-03	3.9E-04
Dieldrin			4.15E-06		1.83E-03	4.1E-06	2.5E-03	Q	2.5E-03	F	2.5E-03	2.5E-03
Diethylphthalate			NA		2.92E+01	2.9E+01	2.9E+01	N	2.9E+01	X DF 2	2.9E+01	2.9E+01
Dimethylphenol,2,4-			NA		7.30E-01	7.3E-01	7.3E-01	N	7.3E-01	X DF 2	7.3E-01	7.3E-01
Dimethylphthalate			NA		3.65E+02	3.7E+02	3.7E+02	N	3.7E+02	X DF 2	3.7E+02	3.7E+02
Di-n-octylphthalate			NA		1.46E+00	1.5E+00	1.5E+00	N	1.5E+00	X DF 2	2.0E-02	2.0E-02
Dinitrobenzene,1,3-			NA		3.65E-03	3.7E-03	1.0E-02	Q	3.7E-03	X DF 2	1.0E-02	3.7E-03
Dinitrophenol,2,4-			NA		7.30E-02	7.3E-02	7.3E-02	N	7.3E-02	X DF 2	7.3E-02	7.3E-02
Dinitrotoluene,2,6-			NA		3.65E-02	3.7E-02	3.7E-02	N	3.7E-02	X DF 2	3.7E-02	3.7E-02
Dinitrotoluene,2,4-			NA		7.30E-02	7.3E-02	7.3E-02	N	7.3E-02	X DF 2	7.3E-02	7.3E-02
Dinoseb	7.00E-03		NA		3.65E-02	7.0E-03	7.0E-03	MCL	7.0E-03	X DF 2	7.0E-03	7.0E-03
Endosulfan			NA		2.19E-01	2.2E-01	2.2E-01	N	2.2E-01	X DF 2	2.2E-01	2.2E-01
Endrin	2.00E-03		NA		1.10E-02	2.0E-03	2.0E-03	MCL	2.0E-03	X DF 2	2.0E-03	2.0E-03
Ethyl benzene	7.00E-01	NA		1.33E+00		7.0E-01	7.0E-01	MCL	7.0E-01	X DF 2	7.0E-01	7.0E-01

LDEQ RECAP
WORKSHEET 1
GW 1 AND 2
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/17/2003

C(mg/l)-Vol GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

COMPOUND	MCL (mg/l)	C(mg/l)-V	C(mg/l)-NV	N(mg/l)-V	N(mg/l)-NV	MCL or min value (C or N)	GW1 (mg/l)		GW2 (mg/l)		FOR CAL SOILGW1	FOR CAL SOILGW2
Fluoranthene			NA		1.46E+00	1.5E+00	1.5E+00	N	1.5E+00	X DF 2	2.1E-01	2.1E-01
Fluorene		NA		2.43E-01		2.4E-01	2.4E-01	N	2.4E-01	X DF 2	2.4E-01	2.4E-01
Heptachlor	4.00E-04		1.47E-05		1.83E-02	4.0E-04	4.0E-04	MCL	4.0E-04	X DF 2	4.0E-04	4.0E-04
Heptachlor epoxide	2.00E-04		7.29E-06		4.75E-04	2.0E-04	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	2.0E-04
Hexachlorobenzene	1.00E-03	6.88E-06		4.87E-03		1.0E-03	1.0E-03	MCL	1.0E-03	X DF 2	1.0E-03	1.0E-03
Hexachlorobutadiene			8.51E-04		7.30E-03	8.5E-04	8.5E-04	C	8.5E-04	X DF 2	8.5E-04	8.5E-04
Hexachlorocyclohexane,alpha			1.05E-05		NA	1.1E-05	3.0E-05	Q	1.1E-05	X DF 2	3.0E-05	1.1E-05
Hexachlorocyclohexane,beta			3.69E-05		NA	3.7E-05	6.0E-05	Q	3.7E-05	X DF 2	6.0E-05	3.7E-05
Hexachlorocyclohexane,gamma	2.00E-04		5.10E-05		1.10E-02	2.0E-04	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	2.0E-04
Hexachlorocyclopentadiene	5.00E-02	NA		4.15E-04		5.0E-02	5.0E-02	MCL	5.0E-02	X DF 2	5.0E-02	5.0E-02
Hexachloroethane		7.90E-04		6.08E-03		7.9E-04	1.0E-02	Q	7.9E-04	X DF 2	1.0E-02	7.9E-04
Indeno(1,2,3-cd)pyrene			9.09E-05		NA	9.1E-05	3.7E-03	Q	9.1E-05	X DF 2	2.2E-05	2.2E-05
Isobutyl alcohol			NA		1.10E+01	1.1E+01	1.1E+01	N	1.1E+01	X DF 2	1.1E+01	1.1E+01
Isophorone			6.99E-02		7.30E+00	7.0E-02	7.0E-02	C	7.0E-02	X DF 2	7.0E-02	7.0E-02
Lead (inorganic)	1.50E-02		NA		NA	1.5E-02	1.5E-02	MCL	1.5E-02	X DF 2	1.5E-02	1.5E-02
Mercury (inorganic)	2.00E-03		NA		1.10E-02	2.0E-03	2.0E-03	MCL	2.0E-03	X DF 2	2.0E-03	2.0E-03
Methoxychlor	4.00E-02		NA		1.83E-01	4.0E-02	4.0E-02	MCL	4.0E-02	X DF 2	4.0E-02	4.0E-02
Methylene chloride	5.00E-03	4.23E-03		1.62E+00		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Methyl ethyl ketone		NA		1.91E+00		1.9E+00	1.9E+00	N	1.9E+00	X DF 2	1.9E+00	1.9E+00
Methyl isobutyl ketone		NA		1.99E+00		2.0E+00	2.0E+00	N	2.0E+00	X DF 2	2.0E+00	2.0E+00
Methylnaphthalene,2-				6.22E-03		6.2E-03	6.2E-03	N	6.2E-03	X DF 2	6.2E-03	6.2E-03
MTBE (methyl tert-butyl ether)	2.00E-02	NA		5.21E+00		2.0E-02	2.0E-02	MCL	2.0E-02	X DF 2	2.0E-02	2.0E-02
Naphthalene		NA		6.22E-03		6.2E-03	1.0E-02	Q	6.2E-03	X DF 2	1.0E-02	6.2E-03
Nickel			NA		7.30E-01	7.3E-01	7.3E-01	N	7.3E-01	X DF 2	7.3E-01	7.3E-01

LDEQ RECAP
WORKSHEET 1
GW 1 AND 2
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/17/2003

C(mg/l)-Vol	GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol	GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol	GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol	GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

COMPOUND	MCL (mg/l)	C(mg/l)-V	C(mg/l)-NV	N(mg/l)-V	N(mg/l)-NV	MCL or min value (C or N)	GW1 (mg/l)		GW2 (mg/l)		FOR CAL SOILGW1	FOR CAL SOILGW2
Nitrate	1.00E+01		NA		5.84E+01	1.0E+01	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	1.0E+01
Nitrite	1.00E+00		NA		3.65E+00	1.0E+00	1.0E+00	MCL	1.0E+00	X DF 2	1.0E+00	1.0E+00
Nitroaniline,2-		NA		2.11E-04		2.1E-04	5.0E-02	Q	2.1E-04	X DF 2	5.0E-02	2.1E-04
Nitroaniline,3-		NA		1.83E-02		1.8E-02	5.0E-02	Q	1.8E-02	X DF 2	5.0E-02	1.8E-02
Nitroaniline,4-			NA		1.10E-01	1.1E-01	1.1E-01	N	1.1E-01	X DF 2	1.1E-01	1.1E-01
Nitrobenzene		NA		3.39E-03		3.4E-03	3.4E-03	N	3.4E-03	X DF 2	3.4E-03	3.4E-03
Nitrophenol,4-			NA		2.92E-01	2.9E-01	2.9E-01	N	2.9E-01	X DF 2	2.9E-01	2.9E-01
Nitrosodi-n-propylamine,n-			9.48E-06		NA	9.5E-06	1.0E-02	Q	1.0E-02	F	1.0E-02	1.0E-02
N-nitrosodiphenylamine			1.35E-02		NA	1.4E-02	1.4E-02	C	1.4E-02	X DF 2	1.4E-02	1.4E-02
Pentachlorophenol	1.00E-03		5.53E-04		1.10E+00	1.0E-03	1.0E-03	MCL	1.0E-03	X DF 2	1.0E-03	1.0E-03
Phenanthrene				1.83E+00		1.8E+00	1.8E+00	N	1.8E+00	X DF 2	1.2E+00	1.2E+00
Phenol		NA		1.83E+00		1.8E+00	1.8E+00	N	1.8E+00	X DF 2	1.8E+00	1.8E+00
Polychlorinated biphenyls	5.00E-04		3.32E-05		7.30E-04	5.0E-04	5.0E-04	MCL	5.0E-04	X DF 2	5.0E-04	5.0E-04
Pyrene		NA		1.83E-01		1.8E-01	1.8E-01	N	1.8E-01	X DF 2	1.4E-01	1.4E-01
Selenium	5.00E-02		NA		1.83E-01	5.0E-02	5.0E-02	MCL	5.0E-02	X DF 2	5.0E-02	5.0E-02
Silver			NA		1.83E-01	1.8E-01	1.8E-01	N	1.8E-01	X DF 2	1.8E-01	1.8E-01
Styrene	1.00E-01	NA		1.62E+00		1.0E-01	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	1.0E-01
Tetrachlorobenzene,1,2,4,5-			NA		1.10E-02	1.1E-02	1.1E-02	N	1.1E-02	X DF 2	1.1E-02	1.1E-02
Tetrachloroethane,1,1,1,2-		4.27E-04		1.83E-01		4.3E-04	5.0E-03	Q	4.3E-04	X DF 2	5.0E-03	4.3E-04
Tetrachloroethane,1,1,2,2-		5.46E-05		3.65E-01		5.5E-05	5.0E-04	Q	5.5E-05	X DF 2	5.0E-04	5.5E-05
Tetrachloroethylene	5.00E-03	1.07E-03		2.51E-01		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Tetrachlorophenol,2,3,4,6-			NA		1.10E+00	1.1E+00	1.1E+00	N	1.1E+00	X DF 2	1.1E+00	1.1E+00
Thallium	2.00E-03		NA		2.56E-03	2.0E-03	2.0E-03	MCL	2.0E-03	X DF 2	2.0E-03	2.0E-03
Toluene	1.00E+00	NA		7.47E-01		1.0E+00	1.0E+00	MCL	1.0E+00	X DF 2	1.0E+00	1.0E+00

LDEQ RECAP
WORKSHEET 1
GW 1 AND 2
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/17/2003

C(mg/l)-Vol GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

COMPOUND	MCL (mg/l)	C(mg/l)-V	C(mg/l)-NV	N(mg/l)-V	N(mg/l)-NV	MCL or min value (C or N)	GW1 (mg/l)		GW2 (mg/l)		FOR CAL SOILGW1	FOR CAL SOILGW2
Toxaphene	3.00E-03		6.03E-05		NA	3.0E-03	3.0E-03	MCL	3.0E-03	X DF 2	3.0E-03	3.0E-03
Trichlorobenzene,1,2,4-	7.00E-02	NA		1.94E-01		7.0E-02	7.0E-02	MCL	7.0E-02	X DF 2	7.0E-02	7.0E-02
Trichloroethane,1,1,1-	2.00E-01	NA		7.93E-01		2.0E-01	2.0E-01	MCL	2.0E-01	X DF 2	2.0E-01	2.0E-01
Trichloroethane,1,1,2-	5.00E-03	1.97E-04		2.43E-02		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Trichloroethene	5.00E-03	2.77E-05		9.68E-03		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Trichlorofluoromethane		NA		1.29E+00		1.3E+00	1.3E+00	N	1.3E+00	X DF 2	1.3E+00	1.3E+00
Trichlorophenol,2,4,5-			NA		3.65E+00	3.7E+00	3.7E+00	N	3.7E+00	X DF 2	3.7E+00	3.7E+00
Trichlorophenol,2,4,6-			6.03E-03		NA	6.0E-03	1.0E-02	Q	6.0E-03	X DF 2	1.0E-02	6.0E-03
Vanadium			NA		2.56E-01	2.6E-01	2.6E-01	N	2.6E-01	X DF 2	2.6E-01	2.6E-01
Vinyl chloride	2.00E-03	4.27E-05		NA		2.0E-03	2.0E-03	MCL	2.0E-03	X DF 2	2.0E-03	2.0E-03
Xylene(mixed)	1.00E+01	NA		2.06E-01		1.0E+01	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	1.0E+01
Zinc			NA		1.10E+01	1.1E+01	1.1E+01	N	1.1E+01	X DF 2	1.1E+01	1.1E+01
Aliphatics C6-C8		NA		3.19E+01		3.2E+01	3.2E+01	N	3.2E+01	X DF 2	3.2E+01	3.2E+01
Aliphatics >C8-C10		NA		1.34E+00		1.3E+00	1.3E+00	N	1.3E+00	X DF 2	1.3E+00	1.3E+00
Aliphatics >C10-C12		NA		1.37E+00		1.4E+00	1.4E+00	N	1.4E+00	X DF 2	1.4E+00	1.4E+00
Aliphatics >C12-C16		NA		1.37E+00		1.4E+00	1.4E+00	N	1.4E+00	X DF 2	1.4E+00	1.4E+00
Aliphatics >C16-C35			NA		7.30E+01	7.3E+01	7.3E+01	N	7.3E+01	X DF 2	7.3E+01	7.3E+01
Aromatics >C8-C10		NA		3.37E-01		3.4E-01	3.4E-01	N	3.4E-01	X DF 2	3.4E-01	3.4E-01
Aromatics >C10-C12		NA		3.37E-01		3.4E-01	3.4E-01	N	3.4E-01	X DF 2	3.4E-01	3.4E-01
Aromatics >C12-C16		NA		3.37E-01		3.4E-01	3.4E-01	N	3.4E-01	X DF 2	3.4E-01	3.4E-01
Aromatics >C16-C21			NA		1.10E+00	1.1E+00	1.1E+00	N	1.1E+00	X DF 2	1.1E+00	1.1E+00
Aromatics >C21-C35			NA		1.10E+00	1.1E+00	1.1E+00	N	1.1E+00	X DF 2	1.1E+00	1.1E+00

LDEQ RECAP
WORKSHEET 1
GW 1 AND 2
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/17/2003

C(mg/l)-Vol	GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol	GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol	GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol	GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

COMPOUND	MCL (mg/l)	C(mg/l)-V	C(mg/l)-NV	N(mg/l)-V	N(mg/l)-NV	MCL or min value (C or N)	GW1 (mg/l)		GW2 (mg/l)		FOR CAL SOILGW1	FOR CAL SOILGW2
TPH-GRO (C6-C10)							3.4E-01		3.4E-01			
TPH-DRO (C10-C28)							3.4E-01		3.4E-01			
TPH-ORO (>C28)							1.1E+00		1.1E+00			

*MTBE - The value listed in the MCL column is the EPA taste/odor advisory value.

LDEQ RECAP
WORKSHEET 2
GW 3NDW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Non-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/17/2003

C (mg/l) GW3NDW = (TR*BWa) / (SFo*(IRWndw+BCF*IRF))
N (mg/l) GW3NDW = (THQ*RfDo*BWa) / (IRWndw+BCF*IRF)

	LAC 33:IX.	**LAC 33:IX.**					**LAC(NDW) or max**	
	1113(HHNDW)	**1113(HHDW)**	**MCL**	**BCF**			**(LAC,MCL, (MIN C, N))**	
COMPOUND	**(mg/L)**	**(mg/L)**	**(mg/l)**	**(l/kg)**	**C (mg/l)**	**N (mg/l)**	**(mg/l)**	
Acenaphthene				3.87E+02	NA	5.36E-01	5.4E-01	(*2)N
Acenaphthylene				2.69E+02	NA	7.68E-01	7.7E-01	(*2)N
Acetone				3.87E-01	NA	7.24E+01	7.2E+01	(*2)N
Aldrin	4.00E-08	4.00E-08					4.0E-08	(*1)LAC(NDW)
Aniline				3.27E+00	7.95E-02	3.17E+00	8.0E-02	(*2)C
Anthracene				9.20E+03	NA	1.14E-01	1.1E-01	(*2)N
Antimony			6.00E-03	9.00E-01	NA	2.62E-01	2.6E-01	(*2)N
Arsenic		5.00E-02	1.00E-02	4.00E+00	2.76E-04	1.24E-01	5.0E-02	LAC(DW)
Barium			2.00E+00	1.00E+00	NA	4.50E+01	4.5E+01	(*2)N
Benzene	1.25E-02	1.10E-03	5.00E-03				1.3E-02	(*1)LAC(NDW)
Benz(a)anthracene				1.26E+04	3.80E-07	NA	3.8E-07	(*2)C
Benzo(a)pyrene			2.00E-04	8.29E+04	5.78E-09	NA	2.0E-04	MCL
Benzo(b)fluoranthene				3.03E+04	1.58E-07	NA	1.6E-07	(*2)C
Benzo(k)fluoranthene				3.03E+04	1.58E-06	NA	1.6E-06	(*2)C
Beryllium			4.00E-03	1.90E+01	NA	2.99E-01	3.0E-01	(*2)N
Biphenyl,1,1-				6.46E+02	NA	2.69E-01	2.7E-01	(*2)N
Bis(2-chloroethyl)ether				1.10E+01	2.06E-04	NA	2.1E-04	(*2)C
Bis(2-chloroisopropyl)ether				5.57E+01	8.31E-04	2.33E+00	8.3E-04	(*2)C
Bis(2-ethyl-hexyl)phthalate			6.00E-03	2.15E+04	1.16E-05	3.26E-03	6.0E-03	MCL
Bromodichloromethane	3.30E-03	2.00E-04	1.00E-01				3.3E-03	(*1)LAC(NDW)
Bromoform	3.47E-02	3.90E-03	1.00E-01				3.5E-02	(*1)LAC(NDW)
Bromomethane				4.81E+00	NA	5.29E-01	5.3E-01	(*2)N
Butyl benzyl phthalate				6.63E+02	NA	1.05E+00	1.0E+00	(*2)N
Cadmium		1.00E-02	5.00E-03	3.77E+03	NA	4.64E-04	1.0E-02	LAC(DW)
Carbon Disulfide				1.95E+01	NA	1.46E+01	1.5E+01	(*2)N
Carbon Tetrachloride	1.20E-03	2.20E-04	5.00E-03				1.2E-03	(*1)LAC(NDW)
Chlordane	1.90E-07	1.90E-07	2.00E-03				1.9E-07	(*1)LAC(NDW)
Chloroaniline,p-				1.64E+01	NA	6.71E-01	6.7E-01	(*2)N

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Non-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/17/2003

Chlorobenzene			1.00E-01	9.42E+01	NA	7.10E-01	7.1E-01	(*2)N
Chlorodibromomethane	5.08E-03	3.90E-04	1.00E-01				5.1E-03	(*1)LAC(NDW)
Chloroethane (Ethylchloride)				6.82E+00	NA	1.24E+02	1.2E+02	(*2)N
Chloroform	7.00E-02	5.30E-03	1.00E-01				7.0E-02	(*1)LAC(NDW)
Chloromethane				2.89E+00	3.67E-02	NA	3.7E-02	(*2)C
Chloronaphthalene,2-				7.69E+02	NA	3.62E-01	3.6E-01	(*2)N
Chlorophenol,2-	1.26E-01	1.00E-04					1.3E-01	(*1)LAC(NDW)
Chromium(III)		5.00E-02	1.00E-01	1.00E+00	NA	9.63E+02	9.6E+02	(*2)N
Chromium(VI)		5.00E-02	1.00E-01	1.00E+00	NA	1.93E+00	1.9E+00	(*2)N
Chrysene				1.26E+04	3.80E-05	NA	3.8E-05	(*2)C
Cobalt				1.00E+00	NA	3.85E+01	3.9E+01	(*2)N
Copper		1.00E+00	1.30E+00	2.26E+04	NA	6.19E-03	1.3E+00	MCL
Cyanide (free)	1.28E+01	6.64E-01	2.00E-01				1.3E+01	(*1)LAC(NDW)
DDD	2.70E-07	2.70E-07					2.7E-07	(*1)LAC(NDW)
DDE	1.90E-07	1.90E-07					1.9E-07	(*1)LAC(NDW)
DDT	1.90E-07	1.90E-07					1.9E-07	(*1)LAC(NDW)
Dibenz(a,h)anthracene				7.28E+04	6.59E-09	NA	6.6E-09	(*2)C
Dibenzofuran				9.16E+02	NA	1.52E-02	1.5E-02	(*2)N
Dibromo-3-chloropropane,1,2-			2.00E-04	3.30E+01	6.68E-05	5.34E-03	2.0E-04	MCL
Dichlorobenzene,1,2-			6.00E-01	8.90E+01	NA	3.37E+00	3.4E+00	(*2)N
Dichlorobenzene,1,3-				6.60E+01	NA	4.47E-02	4.5E-02	(*2)N
Dichlorobenzene,1,4-			7.50E-02	6.00E+01	2.26E-03	1.63E+00	7.5E-02	MCL
Dichlorobenzidine,3,3-				5.07E+02	1.52E-05	NA	1.5E-05	(*2)C
Dichloroethane,1,1-				1.37E+01	NA	1.93E+01	1.9E+01	(*2)N
Dichloroethane,1,2-	6.80E-03	3.60E-04	5.00E-03				6.8E-03	(*1)LAC(NDW)
Dichloroethene,1,1-	5.80E-04	5.00E-05	7.00E-03				5.8E-04	(*1)LAC(NDW)
Dichloroethene,cis,1,2-			7.00E-02	1.64E+01	NA	1.68E+00	1.7E+00	(*2)N
Dichloroethene,trans,1,2-			1.00E-01	2.32E+01	NA	2.53E+00	2.5E+00	(*2)N
Dichlorophenol,2,4-	2.33E-01	3.00E-04					2.3E-01	(*1)LAC(NDW)
Dichloropropane,1,2-			5.00E-03	1.95E+01	2.15E-03	1.67E-01	5.0E-03	MCL
Dichloropropene,1,3-	1.63E-01	9.86E-03					1.6E-01	(*1)LAC(NDW)
Dieldrin	5.00E-08	5.00E-08					5.0E-08	(*1)LAC(NDW)
Diethylphthalate				1.17E+02	NA	2.31E+01	2.3E+01	(*2)N
Dimethylphenol,2,4-				1.50E+02	NA	4.53E-01	4.5E-01	(*2)N

LDEQ RECAP
WORKSHEET 2
GW 3NDW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Non-Drinking Water**
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Dimethylphthalate				5.70E+01	NA	5.70E+02	5.7E+02	(*2)N
Di-n-octylphthalate				1.13E+02	NA	1.19E+00	1.2E+00	(*2)N
Dinitrobenzene,1,3-				8.13E+00	NA	2.78E-02	2.8E-02	(*2)N
Dinitrophenol,2,4-				9.68E+00	NA	4.95E-01	5.0E-01	(*2)N
Dinitrotoluene,2,6-				1.64E+01	NA	1.68E-01	1.7E-01	(*2)N
Dinitrotoluene,2,4-				1.95E+01	NA	2.92E-01	2.9E-01	(*2)N
Dinoseb			7.00E-03	1.34E+02	NA	2.53E-02	2.5E-02	(*2)N
Endosulfan	6.40E-04	4.70E-04					6.4E-04	(*1)LAC(NDW)
Endrin	2.60E-04	2.60E-04	2.00E-03				2.6E-04	(*1)LAC(NDW)
Ethyl benzene	8.10E+00	2.39E+00	7.00E-01				8.1E+00	(*1)LAC(NDW)
Fluoranthene				4.43E+03	NA	3.16E-02	3.2E-02	(*2)N
Fluorene				1.80E+03	NA	7.76E-02	7.8E-02	(*2)N
Heptachlor	7.00E-08	7.00E-08	4.00E-04				7.0E-08	(*1)LAC(NDW)
Heptachlor epoxide			2.00E-04	2.33E+00	5.67E-05	6.71E-03	2.0E-04	MCL
Hexachlorobenzene	2.50E-07	2.50E-07	1.00E-03				2.5E-07	(*1)LAC(NDW)
Hexachlorobutadiene	1.10E-04	9.00E-05					1.1E-04	(*1)LAC(NDW)
Hexachlorocyclohexane,alpha				2.12E+02	2.57E-06	NA	2.6E-06	(*2)C
Hexachlorocyclohexane,beta				2.93E+02	6.54E-06	NA	6.5E-06	(*2)C
Hexachlorocyclohexane,gamma	2.00E-04	1.10E-04	2.00E-04				2.0E-04	(*1)LAC(NDW)
Hexachlorocyclopentadiene			5.00E-02	7.48E+03	NA	2.81E-03	5.0E-02	MCL
Hexachloroethane				1.39E+02	1.74E-03	2.44E-02	1.7E-03	(*2)C
Indeno(1,2,3-cd)pyrene				7.28E+04	6.59E-08	NA	6.6E-08	(*2)C
Isobutyl alcohol				2.19E+00	NA	1.58E+02	1.6E+02	(*2)N
Isophorone				7.00E+00	3.22E-01	6.11E+01	3.2E-01	(*2)C
Lead (inorganic)		5.00E-02	1.50E-02		NA	NA	5.0E-02	LAC(DW)
Mercury (inorganic)		2.00E-03	2.00E-03	8.57E+04	NA	1.23E-05	2.0E-03	LAC(DW)
Methoxychlor			4.00E-02	7.07E+04	NA	2.48E-04	4.0E-02	MCL
Methylene chloride	8.70E-02	4.40E-03	5.00E-03				8.7E-02	(*1)LAC(NDW)
Methyl ethyl ketone				9.61E-01	NA	3.88E+02	3.9E+02	(*2)N
Methyl isobutyl ketone				4.81E+00	NA	3.02E+01	3.0E+01	(*2)N
Methylnaphthalene,2-				2.60E+03	NA	2.69E-02	2.7E-02	(*2)N
MTBE (methyl tert-butyl ether)			2.00E-02	1.00E+00	NA	5.50E+02	5.5E+02	(*2)N
Naphthalene				3.10E+02	NA	2.23E-01	2.2E-01	(*2)N
Nickel				8.00E-01	NA	1.33E+01	1.3E+01	(*2)N

LDEQ RECAP
WORKSHEET 2
GW 3NDW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Non-Drinking Water**
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Nitrate			1.00E+01	1.00E+00	NA	1.03E+03	1.0E+03	(*2)N
Nitrite			1.00E+00	1.00E+00	NA	6.42E+01	6.4E+01	(*2)N
Nitroaniline,2-				1.64E+01	NA	5.04E-01	5.0E-01	(*2)N
Nitroaniline,3-				6.82E+00	NA	9.32E-01	9.3E-01	(*2)N
Nitroaniline,4-				6.82E+00	NA	9.32E-01	9.3E-01	(*2)N
Nitrobenzene				1.37E+01	NA	9.64E-02	9.6E-02	(*2)N
Nitrophenol,4-				1.64E+01	NA	1.34E+00	1.3E+00	(*2)N
Nitrosodi-n-propylamine,n-				6.82E+00	4.44E-05	NA	4.4E-05	(*2)C
N-nitrosodiphenylamine				2.17E+02	3.23E-03	NA	3.2E-03	(*2)C
Pentachlorophenol			1.00E-03	6.40E+02	4.53E-05	1.63E-01	1.0E-03	MCL
Phenanthrene				5.10E+03	NA	2.06E-01	2.1E-01	(*2)N
Phenol				8.13E+00	NA	8.35E+01	8.3E+01	(*2)N
Polychlorinated biphenyls	1.00E-08	1.00E-08	5.00E-04				1.0E-08	(*1)LAC(NDW)
Pyrene				6.90E+01	NA	1.43E+00	1.4E+00	(*2)N
Selenium			5.00E-02	5.69E+03	NA	3.07E-03	5.0E-02	MCL
Silver				2.80E+01	NA	5.39E-01	5.4E-01	(*2)N
Styrene			1.00E-01	9.42E+01	NA	7.10E+00	7.1E+00	(*2)N
Tetrachlorobenzene,1,2,4,5-				1.85E+03	NA	5.66E-04	5.7E-04	(*2)N
Tetrachloroethane,1,1,1,2-				5.57E+01	2.24E-03	1.75E+00	2.2E-03	(*2)C
Tetrachloroethane,1,1,2,2-	1.80E-03	1.60E-04					1.8E-03	(*1)LAC(NDW)
Tetrachloroethylene	2.50E-03	6.50E-04	5.00E-03				2.5E-03	(*1)LAC(NDW)
Tetrachlorophenol,2,3,4,6-				5.88E+02	NA	1.77E-01	1.8E-01	(*2)N
Thallium			2.00E-03	1.30E+02	NA	1.82E-03	2.0E-03	MCL
Toluene	4.62E+01	6.10E+00	1.00E+00				4.6E+01	(*1)LAC(NDW)
Toxaphene	2.40E-07	2.40E-07	3.00E-03				2.4E-07	(*1)LAC(NDW)
Trichlorobenzene,1,2,4-			7.00E-02	1.82E+02	NA	1.88E-01	1.9E-01	(*2)N
Trichloroethane,1,1,1-		2.00E-01	2.00E-01	9.00E+00	NA	9.11E+00	9.1E+00	(*2)N
Trichloroethane,1,1,2-	6.90E-03	5.60E-04	5.00E-03				6.9E-03	(*1)LAC(NDW)
Trichloroethene	2.10E-02	2.80E-03	5.00E-03				2.1E-02	(*1)LAC(NDW)
Trichlorofluoromethane				4.68E+01	NA	2.05E+01	2.0E+01	(*2)N
Trichlorophenol,2,4,5-				5.42E+02	NA	6.40E-01	6.4E-01	(*2)N
Trichlorophenol,2,4,6-				3.82E+02	8.23E-04	NA	8.2E-04	(*2)C
Vanadium				1.00E+00	NA	4.50E+00	4.5E+00	(*2)N
Vinyl chloride	3.58E-02	1.90E-03	2.00E-03				3.6E-02	(*1)LAC(NDW)

LDEQ RECAP
WORKSHEET 2
GW 3NDW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Non-Drinking Water**
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Xylene(mixed)			1.00E+01	1.59E+02	NA	4.28E+00	1.0E+01	MCL
Zinc		5.00E+00		1.26E+02	NA	8.05E+00	8.0E+00	(*2)N
Aliphatics C6-C8				0.00E+00	NA	3.93E+03	3.9E+03	(*2)N
Aliphatics >C8-C10				0.00E+00	NA	7.87E+01	7.9E+01	(*2)N
Aliphatics >C10-C12				0.00E+00	NA	7.87E+01	7.9E+01	(*2)N
Aliphatics >C12-C16				0.00E+00	NA	7.87E+01	7.9E+01	(*2)N
Aliphatics >C16-C35				0.00E+00	NA	1.57E+03	1.6E+03	(*2)N
Aromatics >C8-C10				0.00E+00	NA	3.15E+01	3.1E+01	(*2)N
Aromatics >C10-C12				0.00E+00	NA	3.15E+01	3.1E+01	(*2)N
Aromatics >C12-C16				0.00E+00	NA	3.15E+01	3.1E+01	(*2)N
Aromatics >C16-C21				0.00E+00	NA	2.36E+01	2.4E+01	(*2)N
Aromatics >C21-C35				0.00E+00	NA	2.36E+01	2.4E+01	(*2)N
TPH-GRO (C6-C10)							3.1E+01	
TPH-DRO (C10-C28)							2.4E+01	
TPH-ORO (>C28)							2.4E+01	

References: Data hierarchy is based on (*1) then (*2).

(*1) Louisiana Administrative Code 33.IX.1113, Table 1 (HHNDW)

(*2) The maximum value of LAC 33.IX1113 (DW), MCL, or the minimum of human health non-drinking water criteria calculated in accordance with "Human Health Numerical Criteria Derivations for Toxic Substances", LDEQ-OWR, June 23, 1994; (N=non-carcinogen, C=carcinogen)

Notes:

* BCF values from the Superfund Chemical Data Matrix, June 1996

* BCF values not found in the Superfund Chemical Data Matrix are estimated below

*MTBE - The value listed in the MCL column is the EPA taste/odor advisory value.

LDEQ RECAP
WORKSHEET 2
GW 3NDW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Non-Drinking Water**
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Estimation of BCF from Kow:
log BCF = 0.76 log Kow - 0.23
(from the Handbook of Chemical Property Estimation Methods, Lyman, Reehl, and Rosenblatt,
American Chemical Society, Washington, DC, 1990)

					log Kow	log BCF	BCF	
Acenaphthylene					3.5	2.43	2.69E+02	
Acetone					-2.4E-01	-0.4124	3.87E-01	
Aniline					9.8E-01	0.5148	3.27E+00	
Barium (ionic)							1.00E+00	(1)
Benz(a)anthracene					5.7E+00	4.102	1.26E+04	
Benzo(b)fluoranthene					6.2E+00	4.482	3.03E+04	
Benzo(k)fluoranthene					6.2E+00	4.482	3.03E+04	
Biphenyl, 1,1-					4.0E+00	2.81	6.46E+02	
Bis(2-chloroisopropyl)ether					2.6E+00	1.746	5.57E+01	
Bromomethane					1.2E+00	0.682	4.81E+00	
Carbon disulfide					2.0E+00	1.29	1.95E+01	
Chloroaniline, p-					1.9E+00	1.214	1.64E+01	
Chlorobenzene					2.9E+00	1.974	9.42E+01	
Chloroethane (ethylchloride)					1.4E+00	0.834	6.82E+00	
Chloromethane(Methyl chloride)					9.1E-01	0.4616	2.89E+00	
Chloronaphthalene, 2-					4.1E+00	2.886	7.69E+02	
Chromium (III)							1.00E+00	(1)
Chromium (VI)							1.00E+00	(1)
Chrysene					5.7E+00	4.102	1.26E+04	
Cobalt							1.00E+00	(1)
Dibenz(a,h)anthracene					6.7E+00	4.862	7.28E+04	
Dibenzofuran					4.2E+00	2.962	9.16E+02	
Dibromo-3-chloropropane,1,2-					2.3E+00	1.518	3.30E+01	
Dichloroethane, 1,1-					1.8E+00	1.138	1.37E+01	
Dichloroethene, cis, 1,2-					1.9E+00	1.214	1.64E+01	
Dichloroethene, trans, 1,2-					2.1E+00	1.366	2.32E+01	

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Dichloropropane, 1,2-					2.0E+00	1.29	1.95E+01	
Dinitrobenzene, 1,3-					1.5E+00	0.91	8.13E+00	
Dinitrophenol, 2,4-					1.6E+00	0.986	9.68E+00	
Dinitrotoluene, 2,6-					1.9E+00	1.214	1.64E+01	
Dinitrotoluene, 2,4-					2.0E+00	1.29	1.95E+01	
Dinoseb					3.1E+00	2.126	1.34E+02	
Fluroanthene					5.1E+00	3.646	4.43E+03	
Hexachlorocyclopentadiene					5.4E+00	3.874	7.48E+03	
Indeno(1,2,3-cd)pyrene					6.7E+00	4.862	7.28E+04	
Isobutyl alcohol					7.5E-01	0.34	2.19E+00	
Methyl ethyl ketone					2.8E-01	-0.0172	9.61E-01	
Methyl isobutyl ketone					1.2E+00	0.682	4.81E+00	
MTBE							1.00E+00	(1)
Nitrate							1.00E+00	(1)
Nitrite							1.00E+00	(1)
Nitroaniline, 2-					1.9E+00	1.214	1.64E+01	
Nitroaniline, 3-					1.4E+00	0.834	6.82E+00	
Nitroaniline, 4-					1.4E+00	0.834	6.82E+00	
Nitrobenzene					1.8E+00	1.138	1.37E+01	
Nitrophenol, 4-					1.9E+00	1.214	1.64E+01	
Nitrosodi-n-propylamine, n-					1.4E+00	0.834	6.82E+00	
Phenol					1.5E+00	0.91	8.13E+00	
Styrene					2.9E+00	1.974	9.42E+01	
Tetrachlorobenzene,1,2,4,5-					4.6E+00	3.266	1.85E+03	
Tetrachloroethane,1,1,1,2-					2.6E+00	1.746	5.57E+01	
Trichlorofluoromethane					2.5E+00	1.67	4.68E+01	
Trichlorophenol, 2,4,5-					3.9E+00	2.734	5.42E+02	
Trichlorophenol, 2,4,6-					3.7E+00	2.582	3.82E+02	
Vanadium							1.00E+00	(1)
Xylene (mixed)					3.2E+00	2.202	1.59E+02	
Aliphatics C6-C8							0.00E+00	(2)
Aliphatics >C8-C10							0.00E+00	(2)
Aliphatics >C10-C12							0.00E+00	(2)
Aliphatics >C12-C16							0.00E+00	(2)

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Aliphatics >C16-C35								0.00E+00	(2)
Aromatics >C8-C10								0.00E+00	(2)
Aromatics >C10-C12								0.00E+00	(2)
Aromatics >C12-C16								0.00E+00	(2)
Aromatics >C16-C21								0.00E+00	(2)
Aromatics >C21-C35								0.00E+00	(2)

Notes:
log Kow values from the Superfund Data Matrix, June 1996
(1) Data on this chemical could not be found. Therefore, assume BCF = 1
Xylene (mixed) Kow is the highest value of m,o,p xylene Kow values.
(2) Research has shown that this chemical does not bioconcentrate.

Estimation of Kow from Koc:
log Koc = 0.0784 + (0.7919 * log Kow)
(p 141 Soil Screening Guidance: Technical Background Document, May 1996)

LDEQ RECAP
WORKSHEET 3
GW 3DW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Drinking Water**
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C (mg/l) GW3DW = (TR*BWa) / (SFo*(IRWa+IRWndw+BCF*IRF))
N (mg/l) GW3DW = (THQ*RfDo*BWa) / (IRWa+IRWndw+BCF*IRF)

COMPOUND	**LAC 33:IX. 1113(HHDW) (mg/L)**	**MCL (mg/l)**	**BCF (l/kg)**	**C (mg/l)**	**N (mg/l)**	**LAC, MCL or min (C,N) (mg/l)**	
Acenaphthene			3.87E+02	NA	4.27E-01	4.3E-01	(*3)N
Acenaphthylene			2.69E+02	NA	5.62E-01	5.6E-01	(*3)N
Acetone			3.87E-01	NA	3.34E+00	3.3E+00	(*3)N
Aldrin	4.00E-08					4.0E-08	(*1)LAC
Aniline			3.27E+00	5.70E-03	2.27E-01	5.7E-03	(*3)C
Anthracene			9.20E+03	NA	1.13E-01	1.1E-01	(*3)N
Antimony		6.00E-03				6.0E-03	(*2)MCL
Arsenic	5.00E-02	1.00E-02				5.0E-02	(*1)LAC
Barium		2.00E+00				2.0E+00	(*2)MCL
Benzene	1.10E-03	5.00E-03				1.1E-03	(*1)LAC
Benz(a)anthracene			1.26E+04	3.77E-07	NA	3.8E-07	(*3)C
Benzo(a)pyrene		2.00E-04				2.0E-04	(*2)MCL
Benzo(b)fluoranthene			3.03E+04	1.58E-07	NA	1.6E-07	(*3)C
Benzo(k)fluoranthene			3.03E+04	1.58E-06	NA	1.6E-06	(*3)C
Beryllium		4.00E-03				4.0E-03	(*2)MCL
Biphenyl,1,1-			6.46E+02	NA	2.33E-01	2.3E-01	(*3)N
Bis(2-chloroethyl)ether			1.10E+01	2.76E-05	NA	2.8E-05	(*3)C
Bis(2-chloroisopropyl)ether			5.57E+01	3.12E-04	8.74E-01	3.1E-04	(*3)C
Bis(2-ethyl-hexyl)phthalate		6.00E-03	2.15E+04	1.16E-05	3.24E-03	6.0E-03	(*2)MCL
Bromodichloromethane	2.00E-04	1.00E-01				2.0E-04	(*1)LAC
Bromoform	3.90E-03	1.00E-01				3.9E-03	(*1)LAC
Bromomethane			4.81E+00	NA	4.48E-02	4.5E-02	(*3)N
Butyl benzyl phthalate			6.63E+02	NA	9.12E-01	9.1E-01	(*3)N
Cadmium	1.00E-02	5.00E-03				1.0E-02	(*1)LAC
Carbon Disulfide			1.95E+01	NA	2.82E+00	2.8E+00	(*3)N
Carbon Tetrachloride	2.20E-04	5.00E-03				2.2E-04	(*1)LAC

LDEQ RECAP
WORKSHEET 3
GW 3DW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/17/2003

C (mg/l) GW3DW = (TR*BWa) / (SFo*(IRWa+IRWndw+BCF*IRF))
N (mg/l) GW3DW = (THQ*RfDo*BWa) / (IRWa+IRWndw+BCF*IRF)

COMPOUND	**LAC 33:IX. 1113(HHDW) (mg/L)**	**MCL (mg/l)**	**BCF (l/kg)**	**C (mg/l)**	**N (mg/l)**	**LAC, MCL or min (C,N) (mg/l)**	
Chlordane	1.90E-07	2.00E-03				1.9E-07	(*1)LAC
Chloroaniline,p-			1.64E+01	NA	1.16E-01	1.2E-01	(*3)N
Chlorobenzene		1.00E-01				1.0E-01	(*2)MCL
Chlorodibromomethane	3.90E-04	1.00E-01				3.9E-04	(*1)LAC
Chloroethane (Ethylchloride)			6.82E+00	NA	1.26E+01	1.3E+01	(*3)N
Chloroform	5.30E-03	1.00E-01				5.3E-03	(*1)LAC
Chloromethane			2.89E+00	2.51E-03	NA	2.5E-03	(*3)C
Chloronaphthalene,2-			7.69E+02	NA	3.21E-01	3.2E-01	(*3)N
Chlorophenol,2-	1.00E-04					1.0E-04	(*1)LAC
Chromium(III)	5.00E-02	1.00E-01	1.00E+00	NA	4.98E+01	5.0E-02	(*1)LAC
Chromium(VI)	5.00E-02	1.00E-01				5.0E-02	(*1)LAC
Chrysene			1.26E+04	3.77E-05	NA	3.8E-05	(*3)C
Cobalt			1.00E+00	NA	1.99E+00	2.0E+00	(*3)N
Copper	1.00E+00	1.30E+00				1.0E+00	(*1)LAC
Cyanide (free)	6.64E-01	2.00E-01				6.6E-01	(*1)LAC
DDD	2.70E-07					2.7E-07	(*1)LAC
DDE	1.90E-07					1.9E-07	(*1)LAC
DDT	1.90E-07					1.9E-07	(*1)LAC
Dibenz(a,h)anthracene			7.28E+04	6.58E-09	NA	6.6E-09	(*3)C
Dibenzofuran			9.16E+02	NA	1.37E-02	1.4E-02	(*3)N
Dibromo-3-chloropropane,1,2-		2.00E-04	3.30E+01	1.82E-05	1.45E-03	2.0E-04	(*2)MCL
Dichlorobenzene,1,2-		6.00E-01				6.0E-01	(*2)MCL
Dichlorobenzene,1,3-			6.60E+01	NA	1.85E-02	1.8E-02	(*3)N
Dichlorobenzene,1,4-		7.50E-02				7.5E-02	(*2)MCL
Dichlorobenzidine,3,3-			5.07E+02	1.27E-05	NA	1.3E-05	(*3)C
Dichloroethane,1,1-			1.37E+01	NA	2.96E+00	3.0E+00	(*3)N

LDEQ RECAP
WORKSHEET 3
GW 3DW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/17/2003

C (mg/l) GW3DW = (TR*BWa) / (SFo*(IRWa+IRWndw+BCF*IRF))
N (mg/l) GW3DW = (THQ*RfDo*BWa) / (IRWa+IRWndw+BCF*IRF)

COMPOUND	**LAC 33:IX. 1113(HHDW) (mg/L)**	**MCL (mg/l)**	**BCF (l/kg)**	**C (mg/l)**	**N (mg/l)**	**LAC, MCL or min (C,N) (mg/l)**	
Dichloroethane,1,2-	3.60E-04	5.00E-03				3.6E-04	(*1)LAC
Dichloroethene,1,1-	5.00E-05	7.00E-03				5.0E-05	(*1)LAC
Dichloroethene,cis,1,2-		7.00E-02				7.0E-02	(*2)MCL
Dichloroethene,trans,1,2-		1.00E-01				1.0E-01	(*2)MCL
Dichlorophenol,2,4-	3.00E-04					3.0E-04	(*1)LAC
Dichloropropane,1,2-		5.00E-03				5.0E-03	(*2)MCL
Dichloropropene,1,3-	9.86E-03					9.9E-03	(*1)LAC
Dieldrin	5.00E-08					5.0E-08	(*1)LAC
Diethylphthalate			1.17E+02	NA	1.26E+01	1.3E+01	(*3)N
Dimethylphenol,2,4-			1.50E+02	NA	2.75E-01	2.8E-01	(*3)N
Dimethylphthalate			5.70E+01	NA	2.17E+02	2.2E+02	(*3)N
Di-n-octylphthalate			1.13E+02	NA	6.44E-01	6.4E-01	(*3)N
Dinitrobenzene,1,3-			8.13E+00	NA	3.11E-03	3.1E-03	(*3)N
Dinitrophenol,2,4-			9.68E+00	NA	6.13E-02	6.1E-02	(*3)N
Dinitrotoluene,2,6-			1.64E+01	NA	2.90E-02	2.9E-02	(*3)N
Dinitrotoluene,2,4-			1.95E+01	NA	5.65E-02	5.6E-02	(*3)N
Dinoseb		7.00E-03				7.0E-03	(*2)MCL
Endosulfan	4.70E-04					4.7E-04	(*1)LAC
Endrin	2.60E-04	2.00E-03				2.6E-04	(*1)LAC
Ethyl benzene	2.39E+00	7.00E-01				2.4E+00	(*1)LAC
Fluoranthene			4.43E+03	NA	3.09E-02	3.1E-02	(*3)N
Fluorene			1.80E+03	NA	7.35E-02	7.4E-02	(*3)N
Heptachlor	7.00E-08	4.00E-04				7.0E-08	(*1)LAC
Heptachlor epoxide		2.00E-04				2.0E-04	(*2)MCL
Hexachlorobenzene	2.50E-07	1.00E-03				2.5E-07	(*1)LAC
Hexachlorobutadiene	9.00E-05					9.0E-05	(*1)LAC

LDEQ RECAP
WORKSHEET 3
GW 3DW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/17/2003

C (mg/l) GW3DW = (TR*BWa) / (SFo*(IRWa+IRWndw+BCF*IRF))
N (mg/l) GW3DW = (THQ*RfDo*BWa) / (IRWa+IRWndw+BCF*IRF)

	LAC 33:IX.					**LAC, MCL or**	
	1113(HHDW)	**MCL**	**BCF**			**min (C,N)**	
COMPOUND	**(mg/L)**	**(mg/l)**	**(l/kg)**	**C (mg/l)**	**N (mg/l)**	**(mg/l)**	
Hexachlorocyclohexane,alpha			2.12E+02	1.76E-06	NA	1.8E-06	(*3)C
Hexachlorocyclohexane,beta			2.93E+02	4.89E-06	NA	4.9E-06	(*3)C
Hexachlorocyclohexane,gamma	1.10E-04	2.00E-04				1.1E-04	(*1)LAC
Hexachlorocyclopentadiene		5.00E-02				5.0E-02	(*2)MCL
Hexachloroethane			1.39E+02	1.03E-03	1.44E-02	1.0E-03	(*3)C
Indeno(1,2,3-cd)pyrene			7.28E+04	6.58E-08	NA	6.6E-08	(*3)C
Isobutyl alcohol			2.19E+00	NA	9.85E+00	9.8E+00	(*3)N
Isophorone			7.00E+00	3.31E-02	6.28E+00	3.3E-02	(*3)C
Lead (inorganic)	5.00E-02	1.50E-02				5.0E-02	(*1)LAC
Mercury (inorganic)	2.00E-03	2.00E-03				2.0E-03	(*1)LAC
Methoxychlor		4.00E-02				4.0E-02	(*2)MCL
Methylene chloride	4.40E-03	5.00E-03				4.4E-03	(*1)LAC
Methyl ethyl ketone			9.61E-01	NA	1.99E+01	2.0E+01	(*3)N
Methyl isobutyl ketone			4.81E+00	NA	2.56E+00	2.6E+00	(*3)N
Methylnaphthalene,2-			2.60E+03	NA	2.59E-02	2.6E-02	(*3)N
MTBE (methyl tert-butyl ether)		2.00E-02		NA	2.87E+01	2.0E-02	(*2)MCL
Naphthalene			3.10E+02	NA	1.69E-01	1.7E-01	(*3)N
Nickel			8.00E-01	NA	6.65E-01	6.7E-01	(*3)N
Nitrate		1.00E+01				1.0E+01	(*2)MCL
Nitrite		1.00E+00				1.0E+00	(*2)MCL
Nitroaniline,2-			1.64E+01	NA	8.69E-02	8.7E-02	(*3)N
Nitroaniline,3-			6.82E+00	NA	9.44E-02	9.4E-02	(*3)N
Nitroaniline,4-			6.82E+00	NA	9.44E-02	9.4E-02	(*3)N
Nitrobenzene			1.37E+01	NA	1.48E-02	1.5E-02	(*3)N
Nitrophenol,4-			1.64E+01	NA	2.32E-01	2.3E-01	(*3)N
Nitrosodi-n-propylamine,n-			6.82E+00	4.49E-06	NA	4.5E-06	(*3)C

LDEQ RECAP
WORKSHEET 3
GW 3DW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/17/2003

C (mg/l) GW3DW = (TR*BWa) / (SFo*(IRWa+IRWndw+BCF*IRF))
N (mg/l) GW3DW = (THQ*RfDo*BWa) / (IRWa+IRWndw+BCF*IRF)

COMPOUND	**LAC 33:IX. 1113(HHDW) (mg/L)**	**MCL (mg/l)**	**BCF (l/kg)**	**C (mg/l)**	**N (mg/l)**	**LAC, MCL or min (C,N) (mg/l)**	
N-nitrosodiphenylamine			2.17E+02	2.22E-03	NA	2.2E-03	(*3)C
Pentachlorophenol		1.00E-03				1.0E-03	(*2)MCL
Phenanthrene			5.10E+03	NA	2.02E-01	2.0E-01	(*3)N
Phenol			8.13E+00	NA	9.33E+00	9.3E+00	(*3)N
Polychlorinated biphenyls	1.00E-08	5.00E-04				1.0E-08	(*1)LAC
Pyrene			6.90E+01	NA	6.05E-01	6.1E-01	(*3)N
Selenium		5.00E-02				5.0E-02	(*2)MCL
Silver			2.80E+01	NA	1.32E-01	1.3E-01	(*3)N
Styrene		1.00E-01				1.0E-01	(*2)MCL
Tetrachlorobenzene,1,2,4,5-			1.85E+03	NA	5.37E-04	5.4E-04	(*3)N
Tetrachloroethane,1,1,1,2-			5.57E+01	8.41E-04	6.56E-01	8.4E-04	(*3)C
Tetrachloroethane,1,1,2,2-	1.60E-04					1.6E-04	(*1)LAC
Tetrachloroethylene	6.50E-04	5.00E-03				6.5E-04	(*1)LAC
Tetrachlorophenol,2,3,4,6-			5.88E+02	NA	1.52E-01	1.5E-01	(*3)N
Thallium		2.00E-03				2.0E-03	(*2)MCL
Toluene	6.10E+00	1.00E+00				6.1E+00	(*1)LAC
Toxaphene	2.40E-07	3.00E-03				2.4E-07	(*1)LAC
Trichlorobenzene,1,2,4-		7.00E-02				7.0E-02	(*2)MCL
Trichloroethane,1,1,1-	2.00E-01	2.00E-01				2.0E-01	(*1)LAC
Trichloroethane,1,1,2-	5.60E-04	5.00E-03				5.6E-04	(*1)LAC
Trichloroethene	2.80E-03	5.00E-03				2.8E-03	(*1)LAC
Trichlorofluoromethane			4.68E+01	NA	6.94E+00	6.9E+00	(*3)N
Trichlorophenol,2,4,5-			5.42E+02	NA	5.41E-01	5.4E-01	(*3)N
Trichlorophenol,2,4,6-			3.82E+02	6.54E-04	NA	6.5E-04	(*3)C
Vanadium			1.00E+00	NA	2.32E-01	2.3E-01	(*3)N
Vinyl chloride	1.90E-03	2.00E-03				1.9E-03	(*1)LAC

LDEQ RECAP
WORKSHEET 3
GW 3DW
(mg/l)

Derivation of Management Option 1, 2, & 3 **Groundwater Classification 3-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/17/2003

C (mg/l) GW3DW = (TR*BWa) / (SFo*(IRWa+IRWndw+BCF*IRF))
N (mg/l) GW3DW = (THQ*RfDo*BWa) / (IRWa+IRWndw+BCF*IRF)

COMPOUND	**LAC 33:IX. 1113(HHDW) (mg/L)**	**MCL (mg/l)**	**BCF (l/kg)**	**C (mg/l)**	**N (mg/l)**	**LAC, MCL or min (C,N) (mg/l)**	
Xylene(mixed)		1.00E+01				1.0E+01	(*2)MCL
Zinc	5.00E+00					5.0E+00	(*1)LAC
Aliphatics C6-C8			0.00E+00	NA	1.68E+02	1.7E+02	(*3)N
Aliphatics >C8-C10			0.00E+00	NA	3.35E+00	3.4E+00	(*3)N
Aliphatics >C10-C12			0.00E+00	NA	3.35E+00	3.4E+00	(*3)N
Aliphatics >C12-C16			0.00E+00	NA	3.35E+00	3.4E+00	(*3)N
Aliphatics >C16-C35			0.00E+00	NA	6.70E+01	6.7E+01	(*3)N
Aromatics >C8-C10			0.00E+00	NA	1.34E+00	1.3E+00	(*3)N
Aromatics >C10-C12			0.00E+00	NA	1.34E+00	1.3E+00	(*3)N
Aromatics >C12-C16			0.00E+00	NA	1.34E+00	1.3E+00	(*3)N
Aromatics >C16-C21			0.00E+00	NA	1.01E+00	1.0E+00	(*3)N
Aromatics >C21-C35			0.00E+00	NA	1.01E+00	1.0E+00	(*3)N
TPH-GRO (C6-C10)						1.3E+00	
TPH-DRO (C10-C28)						1.0E+00	
TPH-ORO (>C28)						1.0E+00	

References: Data hierarchy is based on (*1), (*2), and then (*3).
(*1) Louisiana Administrative Code 33.IX.1113, Table 1
Metals criteria are hardness-dependent. Listed criteria assume a hardness value of 50 mg/L.
Site specific criteria may be calculated using the natural logarithm formulas at LAC 33:IX.1113, Table 1.
Drinking water supply is a raw water source which may require treatment before use. Defined at LAC 33:IX.1105.
(*2) EPA's Maximum Contaminant Level (MCL) for drinking water
(*3) Human health public water water supply criteria calculated in accordance with "Human Health Numerical Criteria Derivations for Toxic Substances", LDEQ-OWR, June 23, 1994; (N=non-carcinogen, C=carcinogen)
*MTBE - The value listed in the MCL column is the EPA taste/odor advisory value.

LDEQ RECAP
WORKSHEET 4
SOILni
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFnic (m3/kg)	VFnia (m3/kg)	Soilni C-O (mg/kg)	Soilni C-I (mg/kg)	Soilni N-O (mg/kg)	Soilni N-I (mg/kg)	min value (C or N)	Soilni (mg/kg)	
Acenaphthene	7.85E-08	1.95E+05		NA		3.74E+03		3.7E+03	3.7E+03	N
Acenaphthylene	1.50E-07	1.41E+05		NA		3.47E+03		3.5E+03	3.5E+03	N
Acetone	1.46E-05	1.43E+04		NA		1.74E+03		1.7E+03	1.7E+03	N
Aldrin	2.92E-09	1.01E+06	2.27E+06	2.77E-02		1.77E+00		2.8E-02	2.8E-02	C
Aniline	9.09E-07	5.74E+04	1.29E+05	5.44E+01		2.42E+01		2.4E+01	2.4E+01	N
Anthracene	6.24E-09	6.93E+05		NA		2.19E+04		2.2E+04	2.2E+04	N
Antimony	NA	NA			NA		3.13E+01	3.1E+01	3.1E+01	N
Arsenic	NA	NA			3.90E-01		2.16E+01	3.9E-01	3.9E-01	C
Barium	NA	NA			NA		5.48E+03	5.5E+03	5.5E+03	N
Benzene	3.10E-04	3.11E+03	6.96E+03	1.49E+00		3.69E+01		1.5E+00	1.5E+00	C
Benz(a)anthracene	1.31E-10	4.77E+06	1.07E+07	6.20E-01		NA		6.2E-01	6.2E-01	C
Benzo(a)pyrene	4.17E-11	8.47E+06	1.90E+07	6.21E-02		NA		6.2E-02	3.3E-01	Q
Benzo(b)fluoranthene	1.30E-10	4.81E+06	1.08E+07	6.20E-01		NA		6.2E-01	6.2E-01	C
Benzo(k)fluoranthene	1.98E-11	1.23E+07	2.75E+07	6.21E+00		NA		6.2E+00	6.2E+00	C
Beryllium					NA		1.56E+02	1.6E+02	1.6E+02	N
Biphenyl,1,1-	1.34E-07	1.49E+05		NA		2.93E+03		2.9E+03	2.9E+03	N
Bis(2-chloroethyl)ether	1.03E-06	5.40E+04	1.21E+05	3.16E-01		NA		3.2E-01	3.3E-01	Q
Bis(2-chloroisopropyl)ether	4.76E-06	2.51E+04	5.62E+04	4.92E+00		1.04E+03		4.9E+00	4.9E+00	C
Bis(2-ethyl-hexyl)phthalate	1.41E-10	4.60E+06	1.03E+07	3.45E+01		1.21E+03		3.5E+01	3.5E+01	C
Bromodichloromethane	3.44E-05	9.34E+03	2.09E+04	1.84E+00		2.46E+02		1.8E+00	1.8E+00	C
Bromoform	3.24E-06	3.04E+04	6.81E+04	4.80E+01		5.92E+02		4.8E+01	4.8E+01	C
Bromomethane	7.37E-04	2.02E+03		NA		4.33E+00		4.3E+00	4.3E+00	N

LDEQ RECAP
WORKSHEET 4
SOILni
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFnic (m3/kg)	VFnia (m3/kg)	Soilni C-O (mg/kg)	Soilni C-I (mg/kg)	Soilni N-O (mg/kg)	Soilni N-I (mg/kg)	min value (C or N)	Soilni (mg/kg)	
Butyl benzyl phthalate	1.56E-09	1.38E+06		NA		1.19E+04		1.2E+04	1.2E+04	N
Cadmium	NA	NA			NA		3.90E+01	3.9E+01	3.9E+01	N
Carbon Disulfide	2.03E-03	1.22E+03		NA		3.63E+02		3.6E+02	3.6E+02	N
Carbon Tetrachloride	6.74E-04	2.11E+03	4.72E+03	5.32E-01		1.82E+00		5.3E-01	5.3E-01	C
Chlordane	9.64E-10	1.76E+06	3.95E+06	1.59E+00		3.31E+01		1.6E+00	1.6E+00	C
Chloroaniline,p-	4.99E-07	7.74E+04		NA		1.62E+02		1.6E+02	1.6E+02	N
Chlorobenzene	5.95E-05	7.09E+03		NA		1.68E+02		1.7E+02	1.7E+02	N
Chlorodibromomethane	1.04E-05	1.70E+04	3.80E+04	2.15E+00		3.96E+02		2.2E+00	2.2E+00	C
Chloroethane (Ethylchloride)	4.45E-03	8.20E+02	1.84E+03	4.13E+00		3.29E+03		4.1E+00	4.1E+00	C
Chloroform	2.76E-04	3.30E+03	7.38E+03	6.05E-01		4.43E-01		4.4E-01	4.4E-01	N
Chloromethane	1.18E-03	1.59E+03	3.57E+03	3.49E+00		2.08E+02		3.5E+00	3.5E+00	C
Chloronaphthalene,2-	7.27E-08	2.03E+05		NA		5.02E+03		5.0E+03	5.0E+03	N
Chlorophenol,2-	2.87E-06	3.23E+04		NA		1.53E+02		1.5E+02	1.5E+02	N
Chromium(III)	NA	NA			NA		1.17E+05	1.2E+05	1.2E+05	N
Chromium(VI)	NA	NA			NA		2.35E+02	2.3E+02	2.3E+02	N
Chrysene	3.85E-10	2.79E+06	6.25E+06	6.19E+01		NA		6.2E+01	6.2E+01	C
Cobalt	NA	NA			NA		4.69E+03	4.7E+03	4.7E+03	N
Copper	NA	NA			NA		3.13E+03	3.1E+03	3.1E+03	N
Cyanide (free)	NA	NA			NA		1.52E+03	1.5E+03	1.5E+03	N
DDD	5.16E-10	2.41E+06	5.39E+06	2.40E+00		NA		2.4E+00	2.4E+00	C
DDE	4.75E-10	2.51E+06	5.62E+06	1.69E+00		NA		1.7E+00	1.7E+00	C

LDEQ RECAP
WORKSHEET 4
SOILni
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFnic (m3/kg)	VFnia (m3/kg)	Soilni C-O (mg/kg)	Soilni C-I (mg/kg)	Soilni N-O (mg/kg)	Soilni N-I (mg/kg)	min value (C or N)	Soilni (mg/kg)	
DDT	3.95E-11	8.70E+06	1.95E+07	1.71E+00		3.59E+01		1.7E+00	1.7E+00	C
Dibenz(a,h)anthracene	1.22E-11	1.57E+07	3.51E+07	6.21E-02		NA		6.2E-02	3.3E-01	Q
Dibenzofuran	5.40E-09	7.45E+05		NA		2.93E+02		2.9E+02	2.9E+02	N
Dibromo-3-chloropropane,1,2-	1.86E-06	4.02E+04	8.99E+04	3.47E-01		1.77E+00		3.5E-01	3.5E-01	C
Dichlorobenzene,1,2-	1.78E-05	1.30E+04		NA		9.93E+02		9.9E+02	9.9E+02	N
Dichlorobenzene,1,3-	6.69E-06	2.12E+04		NA		2.09E+01		2.1E+01	2.1E+01	N
Dichlorobenzene,1,4-	1.43E-05	1.45E+04	3.24E+04	6.71E+00		1.62E+03		6.7E+00	6.7E+00	C
Dichlorobenzidine,3,3-	3.80E-08	2.81E+05	6.29E+05	9.69E-01		NA		9.7E-01	9.7E-01	C
Dichloroethane,1,1-	2.93E-04	3.20E+03		NA		6.55E+02		6.6E+02	6.6E+02	N
Dichloroethane,1,2-	9.40E-05	5.64E+03	1.26E+04	8.15E-01		2.31E+01		8.2E-01	8.2E-01	C
Dichloroethene,1,1-	1.26E-03	1.54E+03	3.45E+03	NA		1.33E+02		1.3E+02	1.3E+02	N
Dichloroethene,cis,1,2-	2.79E-04	3.28E+03		NA		4.81E+01		4.8E+01	4.8E+01	N
Dichloroethene,trans,1,2-	5.61E-04	2.31E+03		NA		6.91E+01		6.9E+01	6.9E+01	N
Dichlorophenol,2,4-	4.80E-08	2.50E+05		NA		1.59E+02		1.6E+02	1.6E+02	N
Dichloropropane,1,2-	1.72E-04	4.17E+03	9.35E+03	8.32E-01		6.87E+00		8.3E-01	8.3E-01	C
Dichloropropene,1,3-	8.98E-05	5.77E+03	1.29E+04	3.13E+00		5.05E+01		3.1E+00	3.1E+00	C
Dieldrin	1.18E-09	1.59E+06	3.57E+06	2.98E-02		2.98E+00		3.0E-02	3.0E-02	C
Diethylphthalate	2.65E-07	1.06E+05		NA		3.57E+04		3.6E+04	3.6E+04	N
Dimethylphenol,2,4-	1.87E-07	1.27E+05		NA		9.34E+02		9.3E+02	9.3E+02	N
Dimethylphthalate	4.24E-07	8.40E+04		NA		4.17E+05		4.2E+05	4.2E+05	N
Di-n-octylphthalate	8.38E-13	5.98E+07		NA		2.44E+03		2.4E+03	2.4E+03	N

LDEQ RECAP
WORKSHEET 4
SOILni
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

	DA	VFnic	VFnia	Soilni	Soilni	Soilni	Soilni	min value	Soilni	
COMPOUND	**(cm2/s)**	**(m3/kg)**	**(m3/kg)**	**C-O (mg/kg)**	**C-I (mg/kg)**	**N-O (mg/kg)**	**N-I (mg/kg)**	**(C or N)**	**(mg/kg)**	
Dinitrobenzene,1,3-	2.55E-07	1.08E+05		NA		4.49E+00		4.5E+00	4.5E+00	N
Dinitrophenol,2,4-	1.01E-06	5.45E+04		NA		7.12E+01		7.1E+01	7.1E+01	N
Dinitrotoluene,2,6-	3.54E-07	9.19E+04		NA		4.29E+01		4.3E+01	4.3E+01	N
Dinitrotoluene,2,4-	2.64E-07	1.06E+05		NA		8.94E+01		8.9E+01	8.9E+01	N
Dinoseb	1.71E-07	1.32E+05		NA		4.72E+01		4.7E+01	4.7E+01	N
Endosulfan	1.27E-08	4.86E+05		NA		3.39E+02		3.4E+02	3.4E+02	N
Endrin	2.31E-09	1.14E+06		NA		1.77E+01		1.8E+01	1.8E+01	N
Ethyl benzene	1.40E-04	4.63E+03		NA		1.64E+03		1.6E+03	1.6E+03	N
Fluoranthene	1.08E-09	1.67E+06		NA		2.24E+03		2.2E+03	2.2E+03	N
Fluorene	2.05E-08	3.82E+05		NA		2.77E+03		2.8E+03	2.8E+03	N
Heptachlor	8.62E-05	5.90E+03	1.32E+04	1.63E-02		4.01E+00		1.6E-02	1.6E-02	C
Heptachlor epoxide	2.95E-10	3.19E+06	7.13E+06	5.29E-02		7.85E-01		5.3E-02	5.3E-02	C
Hexachlorobenzene	4.88E-08	2.48E+05	5.55E+05	3.41E-01		5.21E+01		3.4E-01	3.4E-01	C
Hexachlorobutadiene	4.62E-07	8.05E+04	1.80E+05	4.45E+00		8.23E+00		4.5E+00	4.5E+00	C
Hexachlorocyclohexane,alpha	2.19E-08	3.70E+05	8.28E+05	8.18E-02		NA		8.2E-02	8.2E-02	C
Hexachlorocyclohexane,beta	1.45E-08	4.54E+05	1.02E+06	2.91E-01		NA		2.9E-01	2.9E-01	C
Hexachlorocyclohexane,gamma	3.04E-08	3.14E+05	7.04E+05	3.90E-01		1.85E+01		3.9E-01	3.9E-01	C
Hexachlorocyclopentadiene	1.18E-07	1.59E+05		NA		1.38E+01		1.4E+01	1.4E+01	N
Hexachloroethane	3.08E-07	9.85E+04	2.21E+05	3.18E+01		5.19E+01		3.2E+01	3.2E+01	C
Indeno(1,2,3-cd)pyrene	7.32E-12	2.02E+07	4.53E+07	6.21E-01		NA		6.2E-01	6.2E-01	C
Isobutyl alcohol	4.41E-06	2.61E+04		NA		7.33E+03		7.3E+03	7.3E+03	N

LDEQ RECAP
WORKSHEET 4
SOILni
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

	DA	**VFnic**	**VFnia**	**Soilni**	**Soilni**	**Soilni**	**Soilni**	**min value**	**Soilni**	
COMPOUND	**(cm2/s)**	**(m3/kg)**	**(m3/kg)**	**C-O (mg/kg)**	**C-I (mg/kg)**	**N-O (mg/kg)**	**N-I (mg/kg)**	**(C or N)**	**(mg/kg)**	
Isophorone	7.54E-07	6.30E+04	1.41E+05	3.37E+02		7.54E+03		3.4E+02	3.4E+02	C
Lead (inorganic)	NA	NA		NA	NA	NA	NA	NA	NA	
Mercury (inorganic)	NA	NA			NA		2.35E+01	2.3E+01	2.3E+01	N
Methoxychlor	4.01E-10	2.73E+06		NA		3.01E+02		3.0E+02	3.0E+02	N
Methylene chloride	4.29E-04	2.64E+03	5.92E+03	1.87E+01		2.02E+03		1.9E+01	1.9E+01	C
Methyl ethyl ketone	1.31E-05	1.51E+04		NA		5.91E+03		5.9E+03	5.9E+03	N
Methyl isobutyl ketone	2.24E-05	1.16E+04		NA		4.46E+03		4.5E+03	4.5E+03	N
Methylnaphthalene,2-	8.13E-08	1.92E+05		NA		2.22E+02		2.2E+02	2.2E+02	N
MTBE (methyl tert-butyl ether)	1.02E-04	5.41E+03		NA		6.54E+03		6.5E+03	6.5E+03	N
Naphthalene	1.30E-06	4.80E+04		NA		6.20E+01		6.2E+01	6.2E+01	N
Nickel	NA	NA			NA		1.56E+03	1.6E+03	1.6E+03	N
Nitrate	NA	NA			NA		1.25E+05	1.3E+05	1.3E+05	N
Nitrite	NA	NA			NA		7.82E+03	7.8E+03	7.8E+03	N
Nitroaniline,2-	1.01E-05	1.72E+04		NA		7.80E-01		7.8E-01	1.7E+00	Q
Nitroaniline,3-	8.15E-07	6.06E+04		NA		1.29E+02		1.3E+02	1.3E+02	N
Nitroaniline,4-	1.11E-06	5.20E+04		NA		1.05E+02		1.0E+02	1.0E+02	N
Nitrobenzene	9.67E-07	5.56E+04		NA		2.19E+01		2.2E+01	2.2E+01	N
Nitrophenol,4-	5.33E-07	7.49E+04		NA		3.21E+02		3.2E+02	3.2E+02	N
Nitrosodi-n-propylamine,n-	9.19E-07	5.71E+04	1.28E+05	4.42E-02		NA		4.4E-02	3.3E-01	Q
N-nitrosodiphenylamine	2.68E-08	3.34E+05	7.49E+05	9.05E+01		NA		9.0E+01	9.0E+01	C
Pentachlorophenol	2.82E-08	3.26E+05	7.30E+05	2.78E+00		1.27E+03		2.8E+00	2.8E+00	C

LDEQ RECAP
WORKSHEET 4
SOILni
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFnic (m3/kg)	VFnia (m3/kg)	Soilni C-O (mg/kg)	Soilni C-I (mg/kg)	Soilni N-O (mg/kg)	Soilni N-I (mg/kg)	min value (C or N)	Soilni (mg/kg)	
Phenanthrene	1.52E-08	4.43E+05		NA		2.11E+04		2.1E+04	2.1E+04	N
Phenol	8.09E-07	6.08E+04		NA		1.29E+04		1.3E+04	1.3E+04	N
Polychlorinated biphenyls	8.87E-09	5.81E+05	1.30E+06	2.11E-01		1.06E+00		2.1E-01	2.1E-01	C
Pyrene	6.85E-10	2.09E+06		NA		2.29E+03		2.3E+03	2.3E+03	N
Selenium	NA	NA			NA		3.91E+02	3.9E+02	3.9E+02	N
Silver	NA	NA			NA		3.91E+02	3.9E+02	3.9E+02	N
Styrene	1.14E-05	1.62E+04		NA		4.96E+03		5.0E+03	5.0E+03	N
Tetrachlorobenzene,1,2,4,5-	5.71E-07	7.24E+04		NA		1.19E+01		1.2E+01	1.2E+01	N
Tetrachloroethane,1,1,1,2-	1.03E-04	5.39E+03	1.21E+04	2.75E+00		2.28E+02		2.7E+00	2.7E+00	C
Tetrachloroethane,1,1,2,2-	1.36E-05	1.48E+04	3.32E+04	8.10E-01		1.07E+03		8.1E-01	8.1E-01	C
Tetrachloroethylene	2.42E-04	3.52E+03	7.87E+03	8.33E+00		3.41E+02		8.3E+00	8.3E+00	C
Tetrachlorophenol,2,3,4,6-	1.50E-07	1.41E+05		NA		1.44E+03		1.4E+03	1.4E+03	N
Thallium	NA	NA			NA		5.48E+00	5.5E+00	5.5E+00	N
Toluene	1.91E-04	3.96E+03		NA		6.76E+02		6.8E+02	6.8E+02	N
Toxaphene	2.30E-10	3.61E+06	8.09E+06	4.38E-01		NA		4.4E-01	4.4E-01	C
Trichlorobenzene,1,2,4-	1.39E-06	4.63E+04		NA		6.58E+02		6.6E+02	6.6E+02	N
Trichloroethane,1,1,1-	4.39E-04	2.61E+03		NA		8.19E+02		8.2E+02	8.2E+02	N
Trichloroethane,1,1,2-	4.06E-05	8.59E+03	1.92E+04	1.90E+00		4.59E+01		1.9E+00	1.9E+00	C
Trichloroethene	3.65E-04	2.86E+03	6.42E+03	9.98E-02		1.61E+01		1.0E-01	1.0E-01	C
Trichlorofluoromethane	1.93E-03	1.25E+03		NA		3.84E+02		3.8E+02	3.8E+02	N
Trichlorophenol,2,4,5-	4.99E-08	2.45E+05		NA		5.27E+03		5.3E+03	5.3E+03	N

LDEQ RECAP
WORKSHEET 4
SOILni
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

	DA	**VFnic**	**VFnia**	**Soilni**	**Soilni**	**Soilni**	**Soilni**	**min value**	**Soilni**	
COMPOUND	**(cm2/s)**	**(m3/kg)**	**(m3/kg)**	**C-O (mg/kg)**	**C-I (mg/kg)**	**N-O (mg/kg)**	**N-I (mg/kg)**	**(C or N)**	**(mg/kg)**	
Trichlorophenol,2,4,6-	3.64E-08	2.87E+05	6.42E+05	3.97E+01		NA		4.0E+01	4.0E+01	C
Vanadium	NA	NA			NA		5.48E+02	5.5E+02	5.5E+02	N
Vinyl chloride	2.81E-03	1.03E+03	2.31E+03	2.38E-01		NA		2.4E-01	2.4E-01	C
Xylene(mixed)	1.87E-04	4.00E+03		NA		1.79E+02		1.8E+02	1.8E+02	N
Zinc	NA	NA			NA		2.35E+04	2.3E+04	2.3E+04	N
Aliphatics C6-C8	1.40E-03	1.46E+03		NA		1.18E+04		1.2E+04	1.0E+04	O,T
Aliphatics >C8-C10	3.22E-04	3.05E+03		NA		1.18E+03		1.2E+03	1.2E+03	N
Aliphatics >C10-C12	6.28E-05	6.90E+03		NA		2.29E+03		2.3E+03	2.3E+03	N
Aliphatics >C12-C16	1.37E-05	1.48E+04		NA		3.68E+03		3.7E+03	3.7E+03	N
Aliphatics >C16-C35	1.03E-06	5.40E+04		NA		7.09E+04		7.1E+04	1.0E+04	O,T
Aromatics >C8-C10	3.94E-05	8.72E+03		NA		6.49E+02		6.5E+02	6.5E+02	N
Aromatics >C10-C12	7.31E-06	2.02E+04		NA		1.18E+03		1.2E+03	1.2E+03	N
Aromatics >C12-C16	1.40E-06	4.63E+04		NA		1.82E+03		1.8E+03	1.8E+03	N
Aromatics >C16-C21	1.11E-07	1.64E+05		NA		1.48E+03		1.5E+03	1.5E+03	N
Aromatics >C21-C35	1.04E-09	1.70E+06		NA		1.79E+03		1.8E+03	1.8E+03	N
TPH-GRO (C6-C10)								6.5E+02	6.5E+02	
TPH-DRO (C10-C28)								6.5E+02	6.5E+02	
TPH-ORO (>C28)								1.8E+03	1.8E+03	

LDEQ RECAP
WORKSHEET 5
SOILi
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFi (m3/kg)	Soili C-O (mg/kg)	Soili C-I (mg/kg)	Soili N-O (mg/kg)	Soili N-I (mg/kg)	min value (C or N)	Soili (mg/kg)	
Acenaphthene	7.85E-08	3.99E+05	NA		6.12E+04		6.1E+04	6.1E+04	N
Acenaphthylene	1.50E-07	2.89E+05	NA		5.14E+04		5.1E+04	5.1E+04	N
Acetone	1.46E-05	2.93E+04	NA		1.39E+04		1.4E+04	1.4E+04	N
Aldrin	2.92E-09	2.07E+06	1.34E-01		2.44E+01		1.3E-01	1.3E-01	C
Aniline	9.09E-07	1.17E+05	1.75E+02		1.67E+02		1.7E+02	1.7E+02	N
Anthracene	6.24E-09	1.42E+06	NA		4.78E+05		4.8E+05	4.8E+05	N
Antimony	NA	NA		NA		8.18E+02	8.2E+02	8.2E+02	N
Arsenic	NA	NA		2.73E+00		4.39E+02	2.7E+00	2.7E+00	C
Barium	NA	NA		NA		1.43E+05	1.4E+05	1.4E+05	N
Benzene	3.10E-04	6.35E+03	3.08E+00		2.70E+02		3.1E+00	3.1E+00	C
Benz(a)anthracene	1.31E-10	9.75E+06	2.87E+00		NA		2.9E+00	2.9E+00	C
Benzo(a)pyrene	4.17E-11	1.73E+07	2.88E-01		NA		2.9E-01	3.3E-01	Q
Benzo(b)fluoranthene	1.30E-10	9.82E+06	2.87E+00		NA		2.9E+00	2.9E+00	C
Benzo(k)fluoranthene	1.98E-11	2.51E+07	2.88E+01		NA		2.9E+01	2.9E+01	C
Beryllium	NA	NA		NA		4.09E+03	4.1E+03	4.1E+03	N
Biphenyl,1,1-	1.34E-07	3.05E+05	NA		4.42E+04		4.4E+04	4.4E+04	N
Bis(2-chloroethyl)ether	1.03E-06	1.10E+05	1.08E+00		NA		1.1E+00	1.1E+00	C
Bis(2-chloroisopropyl)ether	4.76E-06	5.12E+04	1.67E+01		9.28E+03		1.7E+01	1.7E+01	C
Bis(2-ethyl-hexyl)phthalate	1.41E-10	9.40E+06	1.73E+02		1.73E+04		1.7E+02	1.7E+02	C
Bromodichloromethane	3.44E-05	1.91E+04	4.20E+00		1.86E+03		4.2E+00	4.2E+00	C
Bromoform	3.24E-06	6.21E+04	1.75E+02		5.50E+03		1.8E+02	1.8E+02	C
Bromomethane	7.37E-04	4.12E+03	NA		2.98E+01		3.0E+01	3.0E+01	N

LDEQ RECAP
WORKSHEET 5
SOILi
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

	DA	VFi	Soili	Soili	Soili	Soili	min value	Soili	
COMPOUND	**(cm2/s)**	**(m3/kg)**	**C-O (mg/kg)**	**C-I (mg/kg)**	**N-O (mg/kg)**	**N-I (mg/kg)**	**(C or N)**	**(mg/kg)**	
Butyl benzyl phthalate	1.56E-09	2.83E+06	NA		1.66E+05		1.7E+05	1.7E+05	N
Cadmium	NA	NA		NA		1.01E+03	1.0E+03	1.0E+03	N
Carbon Disulfide	2.03E-03	2.48E+03	NA		2.51E+03		2.5E+03	2.5E+03	N
Carbon Tetrachloride	6.74E-04	4.30E+03	1.14E+00		1.25E+01		1.1E+00	1.1E+00	C
Chlordane	9.64E-10	3.60E+06	9.98E+00		5.66E+02		1.0E+01	1.0E+01	C
Chloroaniline,p-	4.99E-07	1.58E+05	NA		1.69E+03		1.7E+03	1.7E+03	N
Chlorobenzene	5.95E-05	1.45E+04	NA		1.22E+03		1.2E+03	1.2E+03	N
Chlorodibromomethane	1.04E-05	3.46E+04	5.43E+00		3.26E+03		5.4E+00	5.4E+00	C
Chloroethane (Ethylchloride)	4.45E-03	1.68E+03	8.23E+00		2.38E+04		8.2E+00	8.2E+00	C
Chloroform	2.76E-04	6.73E+03	1.20E+00		2.96E+00		1.2E+00	1.2E+00	C
Chloromethane	1.18E-03	3.25E+03	7.27E+00		1.42E+03		7.3E+00	7.3E+00	C
Chloronaphthalene,2-	7.27E-08	4.15E+05	NA		8.32E+04		8.3E+04	8.3E+04	N
Chlorophenol,2-	2.87E-06	6.60E+04	NA		1.45E+03		1.4E+03	1.4E+03	N
Chromium(III)				NA		3.07E+06	3.1E+06	1.0E+06	O
Chromium(VI)				NA		6.13E+03	6.1E+03	6.1E+03	N
Chrysene	3.85E-10	5.70E+06	2.86E+02		NA		2.9E+02	2.9E+02	C
Cobalt	NA	NA		NA		1.23E+05	1.2E+05	1.2E+05	N
Copper	NA	NA		NA		8.18E+04	8.2E+04	8.2E+04	N
Cyanide (free)	NA	NA		NA		3.61E+04	3.6E+04	3.6E+04	N
DDD	5.16E-10	4.92E+06	1.61E+01		NA		1.6E+01	1.6E+01	C
DDE	4.75E-10	5.13E+06	1.14E+01		NA		1.1E+01	1.1E+01	C
DDT	3.95E-11	1.78E+07	1.19E+01		7.20E+02		1.2E+01	1.2E+01	C

LDEQ RECAP
WORKSHEET 5
SOILi
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFi (m3/kg)	Soili C-O (mg/kg)	Soili C-I (mg/kg)	Soili N-O (mg/kg)	Soili N-I (mg/kg)	min value (C or N)	Soili (mg/kg)	
Dibenz(a,h)anthracene	1.22E-11	3.21E+07	2.88E-01		NA		2.9E-01	3.3E-01	Q
Dibenzofuran	5.40E-09	1.52E+06	NA		6.47E+03		6.5E+03	6.5E+03	N
Dibromo-3-chloropropane,1,2-	1.86E-06	8.20E+04	1.76E+00		1.62E+01		1.8E+00	1.8E+00	C
Dichlorobenzene,1,2-	1.78E-05	2.65E+04	NA		7.40E+03		7.4E+03	7.4E+03	N
Dichlorobenzene,1,3-	6.69E-06	4.32E+04	NA		1.79E+02		1.8E+02	1.8E+02	N
Dichlorobenzene,1,4-	1.43E-05	2.96E+04	1.64E+01		2.21E+04		1.6E+01	1.6E+01	C
Dichlorobenzidine,3,3-	3.80E-08	5.73E+05	4.21E+00		NA		4.2E+00	4.2E+00	C
Dichloroethane,1,1-	2.93E-04	6.53E+03	NA		4.66E+03		4.7E+03	4.7E+03	N
Dichloroethane,1,2-	9.40E-05	1.15E+04	1.76E+00		1.66E+02		1.8E+00	1.8E+00	C
Dichloroethene,1,1-	1.26E-03	3.15E+03	NA		9.09E+02		9.1E+02	9.1E+02	N
Dichloroethene,cis,1,2-	2.79E-04	6.69E+03	NA		3.36E+02		3.4E+02	3.4E+02	N
Dichloroethene,trans,1,2-	5.61E-04	4.72E+03	NA		4.77E+02		4.8E+02	4.8E+02	N
Dichlorophenol,2,4-	4.80E-08	5.10E+05	NA		1.98E+03		2.0E+03	2.0E+03	N
Dichloropropane,1,2-	1.72E-04	8.52E+03	1.76E+00		4.86E+01		1.8E+00	1.8E+00	C
Dichloropropene,1,3-	8.98E-05	1.18E+04	9.96E+00		3.42E+02		1.0E+01	1.0E+01	C
Dieldrin	1.18E-09	3.25E+06	1.46E-01		4.18E+01		1.5E-01	1.5E-01	C
Diethylphthalate	2.65E-07	2.17E+05	NA		3.93E+05		3.9E+05	3.9E+05	N
Dimethylphenol,2,4-	1.87E-07	2.59E+05	NA		1.06E+04		1.1E+04	1.1E+04	N
Dimethylphthalate	4.24E-07	1.72E+05	NA		4.40E+06		4.4E+06	1.0E+06	O
Di-n-octylphthalate	8.38E-13	1.22E+08	NA		3.51E+04		3.5E+04	3.5E+04	N
Dinitrobenzene,1,3-	2.55E-07	2.21E+05	NA		4.95E+01		5.0E+01	5.0E+01	N
Dinitrophenol,2,4-	1.01E-06	1.11E+05	NA		6.91E+02		6.9E+02	6.9E+02	N

LDEQ RECAP
WORKSHEET 5
SOILi
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFi (m3/kg)	Soili C-O (mg/kg)	Soili C-I (mg/kg)	Soili N-O (mg/kg)	Soili N-I (mg/kg)	min value (C or N)	Soili (mg/kg)	
Dinitrotoluene,2,6-	3.54E-07	1.88E+05	NA		4.59E+02		4.6E+02	4.6E+02	N
Dinitrotoluene,2,4-	2.64E-07	2.17E+05	NA		9.83E+02		9.8E+02	9.8E+02	N
Dinoseb	1.71E-07	2.70E+05	NA		5.38E+02		5.4E+02	5.4E+02	N
Endosulfan	1.27E-08	9.93E+05	NA		4.50E+03		4.5E+03	4.5E+03	N
Endrin	2.31E-09	2.33E+06	NA		2.46E+02		2.5E+02	2.5E+02	N
Ethyl benzene	1.40E-04	9.45E+03	NA		1.29E+04		1.3E+04	1.3E+04	N
Fluoranthene	1.08E-09	3.40E+06	NA		2.89E+04		2.9E+04	2.9E+04	N
Fluorene	2.05E-08	7.81E+05	NA		5.41E+04		5.4E+04	5.4E+04	N
Heptachlor	8.62E-05	1.20E+04	3.54E-02		2.88E+01		3.5E-02	3.5E-02	C
Heptachlor epoxide	2.95E-10	6.51E+06	2.64E-01		1.12E+01		2.6E-01	2.6E-01	C
Hexachlorobenzene	4.88E-08	5.06E+05	1.99E+00		9.13E+02		2.0E+00	2.0E+00	C
Hexachlorobutadiene	4.62E-07	1.64E+05	1.55E+01		8.60E+01		1.6E+01	1.6E+01	C
Hexachlorocyclohexane,alpha	2.19E-08	7.55E+05	4.42E-01		NA		4.4E-01	4.4E-01	C
Hexachlorocyclohexane,beta	1.45E-08	9.27E+05	1.62E+00		NA		1.6E+00	1.6E+00	C
Hexachlorocyclohexane,gamma	3.04E-08	6.42E+05	2.05E+00		2.85E+02		2.0E+00	2.0E+00	C
Hexachlorocyclopentadiene	1.18E-07	3.25E+05	NA		9.41E+01		9.4E+01	9.4E+01	N
Hexachloroethane	3.08E-07	2.01E+05	1.37E+02		6.84E+02		1.4E+02	1.4E+02	C
Indeno(1,2,3-cd)pyrene	7.32E-12	4.13E+07	2.88E+00		NA		2.9E+00	2.9E+00	C
Isobutyl alcohol	4.41E-06	5.32E+04	NA		6.23E+04		6.2E+04	6.2E+04	N
Isophorone	7.54E-07	1.29E+05	1.11E+03		7.53E+04		1.1E+03	1.1E+03	C
Lead (inorganic)	NA	NA	NA	NA	NA	NA	NA	0.0E+00	Q
Mercury (inorganic)	NA	NA		NA		6.13E+02	6.1E+02	6.1E+02	N

LDEQ RECAP
WORKSHEET 5
SOILi
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFi (m3/kg)	Soili C-O (mg/kg)	Soili C-I (mg/kg)	Soili N-O (mg/kg)	Soili N-I (mg/kg)	min value (C or N)	Soili (mg/kg)	
Methoxychlor	4.01E-10	5.58E+06	NA		4.27E+03		4.3E+03	4.3E+03	N
Methylene chloride	4.29E-04	5.39E+03	4.43E+01		1.98E+04		4.4E+01	4.4E+01	C
Methyl ethyl ketone	1.31E-05	3.09E+04	NA		4.35E+04		4.4E+04	4.4E+04	N
Methyl isobutyl ketone	2.24E-05	2.36E+04	NA		6.35E+04		6.3E+04	6.3E+04	N
Methylnaphthalene,2-	8.13E-08	3.92E+05	NA		1.65E+03		1.7E+03	1.7E+03	N
MTBE (methyl tert-butyl ether)	1.02E-04	1.10E+04	NA		4.71E+04		4.7E+04	4.7E+04	N
Naphthalene	1.30E-06	9.80E+04	NA		4.26E+02		4.3E+02	4.3E+02	N
Nickel	NA	NA		NA		4.09E+04	4.1E+04	4.1E+04	N
Nitrate	NA	NA		NA		3.27E+06	3.3E+06	1.0E+06	O
Nitrite	NA	NA		NA		2.04E+05	2.0E+05	2.0E+05	N
Nitroaniline,2-	1.01E-05	3.52E+04	NA		5.22E+00		5.2E+00	5.2E+00	N
Nitroaniline,3-	8.15E-07	1.24E+05	NA		1.45E+03		1.4E+03	1.4E+03	N
Nitroaniline,4-	1.11E-06	1.06E+05	NA		1.01E+03		1.0E+03	1.0E+03	N
Nitrobenzene	9.67E-07	1.14E+05	NA		2.50E+02		2.5E+02	2.5E+02	N
Nitrophenol,4-	5.33E-07	1.53E+05	NA		3.31E+03		3.3E+03	3.3E+03	N
Nitrosodi-n-propylamine,n-	9.19E-07	1.17E+05	1.42E-01		NA		1.4E-01	3.3E-01	Q
N-nitrosodiphenylamine	2.68E-08	6.83E+05	4.02E+02		NA		4.0E+02	4.0E+02	C
Pentachlorophenol	2.82E-08	6.66E+05	9.73E+00		1.25E+04		9.7E+00	9.7E+00	C
Phenanthrene	1.52E-08	9.06E+05	NA		4.25E+05		4.3E+05	4.3E+05	N
Phenol	8.09E-07	1.24E+05	NA		1.45E+05		1.5E+05	1.5E+05	N
Polychlorinated biphenyls	8.87E-09	1.19E+06	8.98E-01		1.28E+01		9.0E-01	9.0E-01	C
Pyrene	6.85E-10	4.27E+06	NA		5.61E+04		5.6E+04	5.6E+04	N

LDEQ RECAP
WORKSHEET 5
SOILi
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

	DA	VFi	Soili	Soili	Soili	Soili	min value	Soili	
COMPOUND	**(cm2/s)**	**(m3/kg)**	**C-O (mg/kg)**	**C-I (mg/kg)**	**N-O (mg/kg)**	**N-I (mg/kg)**	**(C or N)**	**(mg/kg)**	
Selenium	NA	NA		NA		1.02E+04	1.0E+04	1.0E+04	N
Silver	NA	NA		NA		1.02E+04	1.0E+04	1.0E+04	N
Styrene	1.14E-05	3.32E+04	NA		4.33E+04		4.3E+04	4.3E+04	N
Tetrachlorobenzene,1,2,4,5-	5.71E-07	1.48E+05	NA		1.22E+02		1.2E+02	1.2E+02	N
Tetrachloroethane,1,1,1,2-	1.03E-04	1.10E+04	5.92E+00		1.64E+03		5.9E+00	5.9E+00	C
Tetrachloroethane,1,1,2,2-	1.36E-05	3.03E+04	1.99E+00		8.63E+03		2.0E+00	2.0E+00	C
Tetrachloroethylene	2.42E-04	7.18E+03	3.47E+01		3.37E+03		3.5E+01	3.5E+01	C
Tetrachlorophenol,2,3,4,6-	1.50E-07	2.89E+05	NA		1.66E+04		1.7E+04	1.7E+04	N
Thallium	NA	NA		NA		1.43E+02	1.4E+02	1.4E+02	N
Toluene	1.91E-04	8.10E+03	NA		4.66E+03		4.7E+03	4.7E+03	N
Toxaphene	2.30E-10	7.38E+06	2.19E+00		NA		2.2E+00	2.2E+00	C
Trichlorobenzene,1,2,4-	1.39E-06	9.47E+04	NA		1.17E+04		1.2E+04	1.2E+04	N
Trichloroethane,1,1,1-	4.39E-04	5.34E+03	NA		7.03E+03		7.0E+03	7.0E+03	N
Trichloroethane,1,1,2-	4.06E-05	1.76E+04	4.29E+00		3.44E+02		4.3E+00	4.3E+00	C
Trichloroethene	3.65E-04	5.85E+03	2.06E-01		2.19E+02		2.1E-01	2.1E-01	C
Trichlorofluoromethane	1.93E-03	2.55E+03	NA		2.59E+03		2.6E+03	2.6E+03	N
Trichlorophenol,2,4,5-	4.99E-08	5.00E+05	NA		6.55E+04		6.6E+04	6.6E+04	N
Trichlorophenol,2,4,6-	3.64E-08	5.86E+05	1.73E+02		NA		1.7E+02	1.7E+02	C
Vanadium	NA	NA		NA		1.43E+04	1.4E+04	1.4E+04	N
Vinyl chloride	2.81E-03	2.11E+03	7.87E-01		NA		7.9E-01	7.9E-01	C
Xylene(mixed)	1.87E-04	8.17E+03	NA		1.21E+03		1.2E+03	1.2E+03	N
Zinc	NA	NA		NA		6.13E+05	6.1E+05	6.1E+05	N

LDEQ RECAP
WORKSHEET 5
SOILi
(mg/kg)

Derivation of Management Option 1 & 2 **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/17/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

	DA	**VFi**	**Soili**	**Soili**	**Soili**	**Soili**	**min value**	**Soili**	
COMPOUND	**(cm2/s)**	**(m3/kg)**	**C-O (mg/kg)**	**C-I (mg/kg)**	**N-O (mg/kg)**	**N-I (mg/kg)**	**(C or N)**	**(mg/kg)**	
Aliphatics C6-C8	1.40E-03	2.99E+03	NA		8.03E+04		8.0E+04	1.0E+04	O,T
Aliphatics >C8-C10	3.22E-04	6.23E+03	NA		8.83E+03		8.8E+03	8.8E+03	N
Aliphatics >C10-C12	6.28E-05	1.41E+04	NA		1.96E+04		2.0E+04	1.0E+04	O,T
Aliphatics >C12-C16	1.37E-05	3.02E+04	NA		3.77E+04		3.8E+04	1.0E+04	O,T
Aliphatics >C16-C35	1.03E-06	1.10E+05	NA		6.87E+05		6.9E+05	1.0E+04	O,T
Aromatics >C8-C10	3.94E-05	1.78E+04	NA		5.12E+03		5.1E+03	5.1E+03	N
Aromatics >C10-C12	7.31E-06	4.13E+04	NA		1.10E+04		1.1E+04	1.0E+04	O,T
Aromatics >C12-C16	1.40E-06	9.45E+04	NA		2.14E+04		2.1E+04	1.0E+04	O,T
Aromatics >C16-C21	1.11E-07	3.36E+05	NA		1.75E+04		1.7E+04	1.0E+04	O,T
Aromatics >C21-C35	1.04E-09	3.47E+06	NA		2.52E+04		2.5E+04	1.0E+04	O,T
TPH-GRO (C6-C10)							5.1E+03	5.1E+03	
TPH-DRO (C10-C28)							5.1E+03	5.1E+03	
TPH-ORO (>C28)							2.5E+04	1.0E+04	

LDEQ RECAP
WORKSHEET 6
SOILGW and SOILsat
(mg/kg)

Derivation of Management Option 1 & 2 **SoilGW & Soilsat**
Revision Date: 08/04/2003 Run date: 10/17/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	SoilGW1 (mg/kg)	SoilGW2 (mg/kg)	SoilGW3DW (mg/kg)	SoilGW3NDW (mg/kg)	Soilsat (mg/kg)
Acenaphthene	2.2E+02	2.2E+02	2.5E+02	3.2E+02	NA
Acenaphthylene	8.8E+01	8.8E+01	1.4E+02	1.9E+02	NA
Acetone	1.5E+00	1.5E+00	8.5E+00	1.8E+02	1.3E+05
Aldrin	1.1E+01	1.1E+01	1.1E+01	1.1E+01	NA
Aniline	6.5E-02	6.5E-02	3.2E-02	4.4E-01	1.0E+04
Anthracene	1.2E+02	1.2E+02	1.2E+02	1.2E+02	NA
Antimony	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA
Benzene	5.1E-02	5.1E-02	1.1E-02	1.3E-01	9.0E+02
Benz(a)anthracene	3.3E+02	3.9E+00	1.6E-02	1.6E-02	NA
Benzo(a)pyrene	2.3E+01	2.3E+01	2.3E+01	2.3E+01	NA
Benzo(b)fluoranthene	2.2E+02	1.3E+01	1.3E+01	1.3E+01	NA
Benzo(k)fluoranthene	1.2E+02	1.2E+02	1.2E+02	1.2E+02	NA
Beryllium	NA	NA	NA	NA	NA
Biphenyl,1,1-	1.9E+02	1.9E+02	1.4E+02	1.7E+02	2.3E+02
Bis(2-chloroethyl)ether	6.6E-02	6.6E-02	3.2E-04	2.4E-03	9.8E+03
Bis(2-chloroisopropyl)ether	5.6E-02	2.7E-03	3.1E-03	8.2E-03	8.4E+02
Bis(2-ethyl-hexyl)phthalate	7.9E+01	7.9E+01	7.9E+01	7.9E+01	2.2E+02
Bromodichloromethane	9.2E-01	9.2E-01	9.2E-01	3.0E-02	3.1E+03
Bromoform	1.8E+00	1.8E+00	6.9E-02	6.1E-01	2.7E+03
Bromomethane	4.0E-02	3.5E-02	1.8E-01	2.1E+00	3.0E+03
Butyl benzyl phthalate	4.4E+03	4.4E+03	1.5E+03	1.7E+03	2.2E+02

LDEQ RECAP
WORKSHEET 6
SOILGW and SOILsat
(mg/kg)

Derivation of Management Option 1 & 2 **SoilGW & Soilsat**
Revision Date: 08/04/2003 Run date: 10/17/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	SoilGW1 (mg/kg)	SoilGW2 (mg/kg)	SoilGW3DW (mg/kg)	SoilGW3NDW (mg/kg)	Soilsat (mg/kg)
Cadmium	NA	NA	NA	NA	NA
Carbon Disulfide	1.1E+01	1.1E+01	2.9E+01	1.5E+02	6.0E+02
Carbon Tetrachloride	1.1E-01	1.1E-01	5.0E-03	2.7E-02	9.1E+02
Chlordane	1.2E+01	1.2E+01	1.2E+01	1.2E+01	NA
Chloroaniline,p-	1.5E+00	1.5E+00	1.2E+00	7.0E+00	NA
Chlorobenzene	3.0E+00	3.0E+00	3.0E+00	2.1E+01	7.0E+02
Chlorodibromomethane	1.0E+00	1.0E+00	3.9E-03	5.1E-02	1.3E+03
Chloroethane (Ethylchloride)	3.5E-02	1.3E-02	4.4E+01	4.3E+02	9.9E+02
Chloroform	9.0E-01	9.0E-01	4.8E-02	6.3E-01	3.6E+03
Chloromethane	6.1E-02	9.1E-03	1.5E-02	2.2E-01	1.6E+03
Chloronaphthalene,2-	5.0E+02	5.0E+02	3.3E+02	3.7E+02	NA
Chlorophenol,2-	1.4E+00	1.4E+00	4.6E-03	5.8E+00	5.1E+04
Chromium(III)	NA	NA	NA	NA	NA
Chromium(VI)	NA	NA	NA	NA	NA
Chrysene	7.6E+01	7.6E+01	1.8E+00	1.8E+00	NA
Cobalt	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA
Cyanide (free)	NA	NA	NA	NA	NA
DDD	1.5E+00	1.5E+00	1.5E+00	1.5E+00	NA
DDE	2.0E+00	2.0E+00	2.0E+00	2.0E+00	NA
DDT	2.4E+01	1.6E+01	1.6E+01	1.6E+01	NA
Dibenz(a,h)anthracene	5.4E+02	2.0E+00	2.0E+00	2.0E+00	NA
Dibenzofuran	2.4E+01	2.4E+01	1.3E+01	1.5E+01	1.5E+02

LDEQ RECAP
WORKSHEET 6
SOILGW and SOILsat
(mg/kg)

Derivation of Management Option 1 & 2 **SoilGW & Soilsat**
Revision Date: 08/04/2003 Run date: 10/17/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	SoilGW1 (mg/kg)	SoilGW2 (mg/kg)	SoilGW3DW (mg/kg)	SoilGW3NDW (mg/kg)	Soilsat (mg/kg)
Dibromo-3-chloropropane,1,2-	2.6E-03	2.6E-03	2.6E-03	2.6E-03	7.8E+02
Dichlorobenzene,1,2-	2.9E+01	2.9E+01	2.9E+01	1.6E+02	3.8E+02
Dichlorobenzene,1,3-	2.1E+00	1.1E+00	3.8E+00	9.2E+00	1.3E+03
Dichlorobenzene,1,4-	5.7E+00	5.7E+00	5.7E+00	5.7E+00	NA
Dichlorobenzidine,3,3-	1.8E+00	1.3E-02	1.1E-03	1.4E-03	NA
Dichloroethane,1,1-	7.5E+00	7.5E+00	2.7E+01	1.8E+02	2.3E+03
Dichloroethane,1,2-	3.5E-02	3.5E-02	2.6E-03	4.8E-02	3.0E+03
Dichloroethene,1,1-	8.5E-02	8.5E-02	6.1E-04	7.0E-03	1.4E+03
Dichloroethene,cis,1,2-	4.9E-01	4.9E-01	4.9E-01	1.2E+01	1.2E+03
Dichloroethene,trans,1,2-	7.7E-01	7.7E-01	7.7E-01	1.9E+01	2.4E+03
Dichlorophenol,2,4-	1.2E+01	1.2E+01	3.2E-02	2.5E+01	NA
Dichloropropane,1,2-	4.2E-02	4.2E-02	4.2E-02	4.2E-02	1.2E+03
Dichloropropene,1,3-	4.0E-02	3.2E-03	8.0E-02	1.3E+00	1.1E+03
Dieldrin	7.6E+00	7.6E+00	7.6E+00	7.6E+00	NA
Diethylphthalate	3.6E+02	3.6E+02	1.6E+02	2.8E+02	6.7E+02
Dimethylphenol,2,4-	2.0E+01	2.0E+01	7.6E+00	1.2E+01	NA
Dimethylphthalate	2.8E+03	2.8E+03	1.6E+03	4.3E+03	1.5E+03
Di-n-octylphthalate	2.0E+05	2.0E+05	2.0E+05	2.0E+05	1.0E+04
Dinitrobenzene,1,3-	2.1E-01	7.5E-02	6.4E-02	5.7E-01	5.5E+02
Dinitrophenol,2,4-	3.4E-01	3.4E-01	2.8E-01	2.3E+00	NA
Dinitrotoluene,2,6-	3.9E-01	3.9E-01	3.1E-01	1.8E+00	NA
Dinitrotoluene,2,4-	1.0E+00	1.0E+00	7.9E-01	4.1E+00	NA
Dinoseb	1.2E-01	1.2E-01	1.2E-01	4.4E-01	NA

LDEQ RECAP
WORKSHEET 6
SOILGW and SOILsat
(mg/kg)

Derivation of Management Option 1 & 2 **SoilGW & Soilsat**
Revision Date: 08/04/2003 Run date: 10/17/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	SoilGW1 (mg/kg)	SoilGW2 (mg/kg)	SoilGW3DW (mg/kg)	SoilGW3NDW (mg/kg)	Soilsat (mg/kg)
Endosulfan	5.4E+01	5.4E+01	5.4E+01	1.6E-01	NA
Endrin	2.6E+00	2.6E+00	3.4E-01	3.4E-01	NA
Ethyl benzene	1.9E+01	1.9E+01	6.6E+01	2.2E+02	2.3E+02
Fluoranthene	1.2E+03	1.2E+03	1.8E+02	1.9E+02	NA
Fluorene	2.3E+02	2.3E+02	6.8E+01	7.2E+01	NA
Heptachlor	5.0E-01	5.0E-01	5.0E-01	5.0E-01	NA
Heptachlor epoxide	2.0E+00	2.0E+00	2.0E+00	2.0E+00	NA
Hexachlorobenzene	9.6E+00	9.6E+00	9.6E+00	9.6E+00	NA
Hexachlorobutadiene	5.5E+00	5.5E+00	5.8E-01	7.1E-01	1.0E+03
Hexachlorocyclohexane,alpha	6.4E-03	2.2E-03	3.7E-04	5.5E-04	NA
Hexachlorocyclohexane,beta	1.6E-02	9.5E-03	1.3E-03	1.7E-03	NA
Hexachlorocyclohexane,gamma	3.3E-02	3.3E-02	1.8E-02	3.3E-02	NA
Hexachlorocyclopentadiene	1.2E+03	1.2E+03	1.2E+03	1.2E+03	2.2E+03
Hexachloroethane	2.2E+00	1.7E-01	2.2E-01	3.8E-01	NA
Indeno(1,2,3-cd)pyrene	9.2E+00	9.2E+00	9.2E+00	9.2E+00	NA
Isobutyl alcohol	3.0E+01	3.0E+01	2.7E+01	4.3E+02	1.2E+04
Isophorone	5.6E-01	5.6E-01	2.7E-01	2.6E+00	4.9E+03
Lead (inorganic)	NA	NA	NA	NA	NA
Mercury (inorganic)	NA	NA	NA	NA	NA
Methoxychlor	3.8E+02	3.8E+02	3.8E+02	3.8E+02	NA
Methylene chloride	1.7E-02	1.7E-02	1.5E-02	2.9E-01	2.2E+03
Methyl ethyl ketone	5.0E+00	5.0E+00	5.2E+01	1.0E+03	2.9E+04
Methyl isobutyl ketone	6.4E+00	6.4E+00	8.3E+00	9.7E+01	3.1E+03

LDEQ RECAP
WORKSHEET 6
SOILGW and SOILsat
(mg/kg)

Derivation of Management Option 1 & 2 **SoilGW & Soilsat**
Revision Date: 08/04/2003 Run date: 10/17/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	SoilGW1 (mg/kg)	SoilGW2 (mg/kg)	SoilGW3DW (mg/kg)	SoilGW3NDW (mg/kg)	Soilsat (mg/kg)
Methylnaphthalene,2-	1.7E+00	1.7E+00	7.0E+00	7.3E+00	NA
MTBE (methyl tert-butyl ether)	7.7E-02	7.7E-02	7.7E-02	2.1E+03	9.8E+03
Naphthalene	1.5E+00	9.0E-01	2.5E+01	3.2E+01	NA
Nickel	NA	NA	NA	NA	NA
Nitrate	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA
Nitroaniline,2-	2.3E-01	9.5E-04	3.9E-01	2.3E+00	2.8E+02
Nitroaniline,3-	2.3E-01	8.5E-02	4.4E-01	4.3E+00	2.8E+02
Nitroaniline,4-	4.3E-01	4.3E-01	3.7E-01	3.6E+00	1.4E+02
Nitrobenzene	5.7E-02	5.7E-02	2.5E-01	1.6E+00	1.8E+03
Nitrophenol,4-	2.6E+00	2.6E+00	2.1E+00	1.2E+01	5.4E+03
Nitrosodi-n-propylamine,n-	5.3E-02	5.3E-02	5.3E-02	2.4E-04	NA
N-nitrosodiphenylamine	2.1E+00	2.1E+00	3.5E-01	5.1E-01	NA
Pentachlorophenol	1.1E-01	1.1E-01	1.1E-01	1.1E-01	NA
Phenanthrene	6.6E+02	6.6E+02	1.2E+02	1.2E+02	NA
Phenol	1.1E+01	1.1E+01	5.5E+01	4.9E+02	NA
Polychlorinated biphenyls	1.9E+01	1.9E+01	1.9E+01	1.9E+01	5.7E+01
Pyrene	1.1E+03	1.1E+03	1.1E+03	1.1E+03	NA
Selenium	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA
Styrene	1.1E+01	1.1E+01	1.1E+01	7.9E+02	1.7E+03
Tetrachlorobenzene,1,2,4,5-	6.9E+00	6.9E+00	3.4E-01	3.6E-01	1.9E+01
Tetrachloroethane,1,1,1,2-	4.6E-02	3.9E-03	7.7E-03	2.0E-02	5.0E+02

LDEQ RECAP
WORKSHEET 6
SOILGW and SOILsat
(mg/kg)

Derivation of Management Option 1 & 2 **SoilGW & Soilsat**
Revision Date: 08/04/2003 Run date: 10/17/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	SoilGW1 (mg/kg)	SoilGW2 (mg/kg)	SoilGW3DW (mg/kg)	SoilGW3NDW (mg/kg)	Soilsat (mg/kg)
Tetrachloroethane,1,1,2,2-	6.0E-03	6.5E-04	1.9E-03	2.2E-02	1.8E+03
Tetrachloroethylene	1.8E-01	1.8E-01	2.3E-02	8.9E-02	3.6E+02
Tetrachlorophenol,2,3,4,6-	3.1E+01	3.1E+01	4.2E+00	5.0E+00	1.4E+03
Thallium	NA	NA	NA	NA	NA
Toluene	2.0E+01	2.0E+01	1.2E+02	9.1E+02	5.2E+02
Toxaphene	3.4E+01	3.4E+01	3.4E+01	3.4E+01	NA
Trichlorobenzene,1,2,4-	1.4E+01	1.4E+01	1.4E+01	3.8E+01	NA
Trichloroethane,1,1,1-	4.0E+00	4.0E+00	4.0E+00	1.8E+02	1.3E+03
Trichloroethane,1,1,2-	5.8E-02	5.8E-02	6.5E-03	8.0E-02	2.5E+03
Trichloroethene	7.3E-02	7.3E-02	4.1E-02	3.0E-01	8.0E+02
Trichlorofluoromethane	3.7E+01	3.7E+01	2.0E+02	5.8E+02	1.6E+03
Trichlorophenol,2,4,5-	3.2E+02	3.2E+02	4.7E+01	5.6E+01	NA
Trichlorophenol,2,4,6-	1.3E+00	7.9E-01	8.6E-02	1.1E-01	NA
Vanadium	NA	NA	NA	NA	NA
Vinyl chloride	1.3E-02	1.3E-02	1.3E-02	2.4E-01	9.2E+02
Xylene(mixed)	1.8E+02	1.8E+02	1.8E+02	1.8E+02	1.5E+02
Zinc	NA	NA	NA	NA	NA
Aliphatics C6-C8	1.8E+04	1.8E+04	9.5E+04	2.2E+06	NA
Aliphatics >C8-C10	5.3E+03	5.3E+03	1.3E+04	3.1E+05	NA
Aliphatics >C10-C12	4.2E+04	4.2E+04	1.0E+05	2.4E+06	NA
Aliphatics >C12-C16	8.2E+05	8.2E+05	2.0E+06	4.7E+07	NA
Aliphatics >C16-C35	5.5E+09	5.5E+09	5.1E+09	1.2E+11	NA
Aromatics >C8-C10	6.5E+01	6.5E+01	2.6E+02	6.1E+03	NA

LDEQ RECAP
WORKSHEET 6
SOILGW and SOILsat
(mg/kg)

Derivation of Management Option 1 & 2 **SoilGW & Soilsat**
Revision Date: 08/04/2003 Run date: 10/17/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	SoilGW1 (mg/kg)	SoilGW2 (mg/kg)	SoilGW3DW (mg/kg)	SoilGW3NDW (mg/kg)	Soilsat (mg/kg)
Aromatics >C10-C12	1.0E+02	1.0E+02	4.1E+02	9.6E+03	NA
Aromatics >C12-C16	2.0E+02	2.0E+02	8.1E+02	1.9E+04	NA
Aromatics >C16-C21	2.1E+03	2.1E+03	1.9E+03	4.5E+04	NA
Aromatics >C21-C35	1.7E+04	1.7E+04	1.5E+04	3.6E+05	NA
TPH-GRO (C6-C10)	6.5E+01	6.5E+01	2.6E+02	6.1E+03	
TPH-DRO (C10-C28)	6.5E+01	6.5E+01	2.6E+02	6.1E+03	
TPH-ORO (>C28)	1.7E+04	1.7E+04	1.5E+04	3.6E+05	

LDEQ RECAP
WORKSHEET 9
SOILni-PEF
(mg/kg)

Soil with particulate emissions-Nonindustrial	Derivation of Management Option 2 RS			
Revision Date: 08/04/2003	Run date: 10/17/2003			
INPUTS TO SOIL PATICULATE EMISSION MODEL-NONINDUSTRIAL		Site-Specific		
equivalent threshold value of windspeed at 7m	Ut =	11.32	m/s	
mean annual windspeed	Um =	4.69	m/s	
inverse of mean concentration at enter of source (g/m2-s per kg/m3)	Q/C =	enter in soil properties spreadsheet		
fraction of vegetative cover	V =	0.5	unitless	
function dependent on Um/Ut - See Below	F(x) =	0.194	unitless	

x = 0.886*(Ut/Um)		
for x<0.5	F(x) =	1.91
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x
for 0.8<x<1	F(x) =	2.6 - x
for 1<x<2	F(x) =	2.9 - 1.3*x
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)

PEFni = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))

DA & VF calculations are in the Soilni worksheet

Soilni-PEF-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj*(1/VFnia+1/PEFni)+SFo*1e-6*ABS*IRDadj))
Soilni-PEF-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj/PEFni+SFo*1e-6*ABS*IRDadj))
Soilni-PEF-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic+1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-PEF-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))

	PEFni	Soilni-PEF	Soilni-PEF	Soilni-PEF	Soilni-PEF	min value
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)
Acenaphthene	1.11E+09	#VALUE!		3.74E+03		3.7E+03
Acenaphthylene	1.11E+09	#VALUE!		3.47E+03		3.5E+03
Acetone	1.11E+09	#VALUE!		1.74E+03		1.7E+03
Aldrin	1.11E+09	2.77E-02		1.77E+00		2.8E-02
Aniline	1.11E+09	5.44E+01		2.42E+01		2.4E+01
Anthracene	1.11E+09	#VALUE!		2.19E+04		2.2E+04
Antimony	1.11E+09		#VALUE!		3.13E+01	3.1E+01
Arsenic	1.11E+09		3.90E-01		2.16E+01	3.9E-01
Barium	1.11E+09		#VALUE!		5.36E+03	5.4E+03
Benzene	1.11E+09	1.49E+00		3.69E+01		1.5E+00
Benz(a)anthracene	1.11E+09	6.20E-01		#VALUE!		6.2E-01
Benzo(a)pyrene	1.11E+09	6.21E-02		#VALUE!		6.2E-02
Benzo(b)fluoranthene	1.11E+09	6.20E-01		#VALUE!		6.2E-01
Benzo(k)fluoranthene	1.11E+09	6.21E+00		#VALUE!		6.2E+00
Beryllium	1.11E+09		#VALUE!		1.54E+02	1.5E+02
Biphenyl,1,1-	1.11E+09	#VALUE!		2.93E+03		2.9E+03
Bis(2-chloroethyl)ether	1.11E+09	3.16E-01		#VALUE!		3.2E-01
Bis(2-chloroisopropyl)ether	1.11E+09	4.92E+00		1.04E+03		4.9E+00
Bis(2-ethyl-hexyl)phthalate	1.11E+09	3.45E+01		1.21E+03		3.5E+01
Bromodichloromethane	1.11E+09	1.84E+00		2.46E+02		1.8E+00
Bromoform	1.11E+09	4.80E+01		5.92E+02		4.8E+01
Bromomethane	1.11E+09	#VALUE!		4.33E+00		4.3E+00

LDEQ RECAP
WORKSHEET 9
SOILni-PEF
(mg/kg)

Soil with particulate emissions-Nonindustrial			Derivation of Management Option 2 RS						
Revision Date: 08/04/2003			Run date:	10/17/2003					
INPUTS TO SOIL PATICULATE EMISSION MODEL-NONINDUSTRIAL					Site-Specific				
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s			
mean annual windspeed				Um =	4.69	m/s			
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet				
fraction of vegetative cover				V =	0.5	unitless			
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless			
x = 0.886*(Ut/Um)									
for x<0.5	F(x) =	1.91							
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x							
for 0.8<x<1	F(x) =	2.6 - x							
for 1<x<2	F(x) =	2.9 - 1.3*x							
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)							
PEFni = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))									
DA & VF calculations are in the Soilni worksheet									
Soilni-PEF-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj*(1/VFnia+1/PEFni)+SFo*1e-6*ABS*IRDadj))									
Soilni-PEF-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj/PEFni+SFo*1e-6*ABS*IRDadj))									
Soilni-PEF-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic+1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))									
Soilni-PEF-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))									
	PEFni	Soilni-PEF	Soilni-PEF	Soilni-PEF	Soilni-PEF	min value			
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)			
Butyl benzyl phthalate	1.11E+09	#VALUE!		1.19E+04		1.2E+04			
Cadmium	1.11E+09		#VALUE!		3.90E+01	3.9E+01			
Carbon Disulfide	1.11E+09	#VALUE!		3.63E+02		3.6E+02			
Carbon Tetrachloride	1.11E+09	5.32E-01		1.82E+00		5.3E-01			
Chlordane	1.11E+09	1.59E+00		3.31E+01		1.6E+00			
Chloroaniline,p-	1.11E+09	#VALUE!		1.62E+02		1.6E+02			
Chlorobenzene	1.11E+09	#VALUE!		1.68E+02		1.7E+02			
Chlorodibromomethane	1.11E+09	2.15E+00		3.96E+02		2.2E+00			
Chloroethane (Ethylchloride)	1.11E+09	4.13E+00		3.29E+03		4.1E+00			
Chloroform	1.11E+09	6.05E-01		4.43E-01		4.4E-01			
Chloromethane	1.11E+09	3.49E+00		2.08E+02		3.5E+00			
Chloronaphthalene,2-	1.11E+09	#VALUE!		5.02E+03		5.0E+03			
Chlorophenol,2-	1.11E+09	#VALUE!		1.53E+02		1.5E+02			
Chromium(III)	1.11E+09		#VALUE!		#VALUE!	#VALUE!			
Chromium(VI)	1.11E+09		#VALUE!		#VALUE!	#VALUE!			
Chrysene	1.11E+09	6.19E+01		#VALUE!		6.2E+01			
Cobalt	1.11E+09		#VALUE!		3.18E+03	3.2E+03			
Copper	1.11E+09		#VALUE!		#VALUE!	#VALUE!			
Cyanide (free)	1.11E+09		#VALUE!		#VALUE!	#VALUE!			
DDD	1.11E+09	2.40E+00		#VALUE!		2.4E+00			
DDE	1.11E+09	1.69E+00		#VALUE!		1.7E+00			
DDT	1.11E+09	1.71E+00		3.59E+01		1.7E+00			

LDEQ RECAP
WORKSHEET 9
SOILni-PEF
(mg/kg)

Soil with particulate emissions-Nonindustrial			Derivation of Management Option 2 RS					
Revision Date: 08/04/2003			Run date:	10/17/2003				
INPUTS TO SOIL PATICULATE EMISSION MODEL-NONINDUSTRIAL					Site-Specific			
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s		
mean annual windspeed				Um =	4.69	m/s		
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet			
fraction of vegetative cover				V =	0.5	unitless		
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless		
x = 0.886*(Ut/Um)								
for x<0.5	F(x) =	1.91						
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x						
for 0.8<x<1	F(x) =	2.6 - x						
for 1<x<2	F(x) =	2.9 - 1.3*x						
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)						
PEFni = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))								
DA & VF calculations are in the Soilni worksheet								
Soilni-PEF-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj*(1/VFnia+1/PEFni)+SFo*1e-6*ABS*IRDadj))								
Soilni-PEF-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj/PEFni+SFo*1e-6*ABS*IRDadj))								
Soilni-PEF-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic+1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))								
Soilni-PEF-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))								
	PEFni	Soilni-PEF	Soilni-PEF	Soilni-PEF	Soilni-PEF	min value		
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)		
Dibenz(a,h)anthracene	1.11E+09	6.21E-02		#VALUE!		6.2E-02		
Dibenzofuran	1.11E+09	#VALUE!		2.93E+02		2.9E+02		
Dibromo-3-chloropropane,1,2-	1.11E+09	3.47E-01		1.77E+00		3.5E-01		
Dichlorobenzene,1,2-	1.11E+09	#VALUE!		9.93E+02		9.9E+02		
Dichlorobenzene,1,3-	1.11E+09	#VALUE!		2.09E+01		2.1E+01		
Dichlorobenzene,1,4-	1.11E+09	6.71E+00		1.62E+03		6.7E+00		
Dichlorobenzidine,3,3-	1.11E+09	9.68E-01		#VALUE!		9.7E-01		
Dichloroethane,1,1-	1.11E+09	#VALUE!		6.55E+02		6.6E+02		
Dichloroethane,1,2-	1.11E+09	8.15E-01		2.31E+01		8.2E-01		
Dichloroethene,1,1-	1.11E+09	#VALUE!		1.33E+02		1.3E+02		
Dichloroethene,cis,1,2-	1.11E+09	#VALUE!		4.81E+01		4.8E+01		
Dichloroethene,trans,1,2-	1.11E+09	#VALUE!		6.91E+01		6.9E+01		
Dichlorophenol,2,4-	1.11E+09	#VALUE!		1.59E+02		1.6E+02		
Dichloropropane,1,2-	1.11E+09	8.32E-01		6.87E+00		8.3E-01		
Dichloropropene,1,3-	1.11E+09	3.13E+00		5.05E+01		3.1E+00		
Dieldrin	1.11E+09	2.98E-02		2.98E+00		3.0E-02		
Diethylphthalate	1.11E+09	#VALUE!		3.57E+04		3.6E+04		
Dimethylphenol,2,4-	1.11E+09	#VALUE!		9.34E+02		9.3E+02		
Dimethylphthalate	1.11E+09	#VALUE!		4.17E+05		4.2E+05		
Di-n-octylphthalate	1.11E+09	#VALUE!		2.44E+03		2.4E+03		
Dinitrobenzene,1,3-	1.11E+09	#VALUE!		4.49E+00		4.5E+00		
Dinitrophenol,2,4-	1.11E+09	#VALUE!		7.12E+01		7.1E+01		

LDEQ RECAP
WORKSHEET 9
SOILni-PEF
(mg/kg)

Soil with particulate emissions-Nonindustrial			Derivation of Management Option 2 RS					
Revision Date: 08/04/2003			Run date:	10/17/2003				
INPUTS TO SOIL PATICULATE EMISSION MODEL-NONINDUSTRIAL					Site-Specific			
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s		
mean annual windspeed				Um =	4.69	m/s		
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet			
fraction of vegetative cover				V =	0.5	unitless		
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless		
x = 0.886*(Ut/Um)								
for x<0.5	F(x) =	1.91						
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x						
for 0.8<x<1	F(x) =	2.6 - x						
for 1<x<2	F(x) =	2.9 - 1.3*x						
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)						
PEFni = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))								
DA & VF calculations are in the Soilni worksheet								
Soilni-PEF-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj*(1/VFnia+1/PEFni)+SFo*1e-6*ABS*IRDadj))								
Soilni-PEF-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj/PEFni+SFo*1e-6*ABS*IRDadj))								
Soilni-PEF-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic+1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))								
Soilni-PEF-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))								
	PEFni	Soilni-PEF	Soilni-PEF	Soilni-PEF	Soilni-PEF	min value		
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)		
Dinitrotoluene,2,6-	1.11E+09	#VALUE!		4.29E+01		4.3E+01		
Dinitrotoluene,2,4-	1.11E+09	#VALUE!		8.94E+01		8.9E+01		
Dinoseb	1.11E+09	#VALUE!		4.72E+01		4.7E+01		
Endosulfan	1.11E+09	#VALUE!		3.39E+02		3.4E+02		
Endrin	1.11E+09	#VALUE!		1.77E+01		1.8E+01		
Ethyl benzene	1.11E+09	#VALUE!		1.64E+03		1.6E+03		
Fluoranthene	1.11E+09	#VALUE!		2.24E+03		2.2E+03		
Fluorene	1.11E+09	#VALUE!		2.77E+03		2.8E+03		
Heptachlor	1.11E+09	1.63E-02		4.01E+00		1.6E-02		
Heptachlor epoxide	1.11E+09	5.29E-02		7.85E-01		5.3E-02		
Hexachlorobenzene	1.11E+09	3.41E-01		5.21E+01		3.4E-01		
Hexachlorobutadiene	1.11E+09	4.45E+00		8.23E+00		4.5E+00		
Hexachlorocyclohexane,alpha	1.11E+09	8.18E-02		#VALUE!		8.2E-02		
Hexachlorocyclohexane,beta	1.11E+09	2.91E-01		#VALUE!		2.9E-01		
Hexachlorocyclohexane,gamma	1.11E+09	3.90E-01		1.85E+01		3.9E-01		
Hexachlorocyclopentadiene	1.11E+09	#VALUE!		1.38E+01		1.4E+01		
Hexachloroethane	1.11E+09	3.18E+01		5.19E+01		3.2E+01		
Indeno(1,2,3-cd)pyrene	1.11E+09	6.21E-01		#VALUE!		6.2E-01		
Isobutyl alcohol	1.11E+09	#VALUE!		7.33E+03		7.3E+03		
Isophorone	1.11E+09	3.37E+02		7.54E+03		3.4E+02		
Lead (inorganic)	1.11E+09		#VALUE!		#VALUE!	#VALUE!		
Mercury (inorganic)	1.11E+09		#VALUE!		2.35E+01	2.3E+01		

LDEQ RECAP
WORKSHEET 9
SOILni-PEF
(mg/kg)

Soil with particulate emissions-Nonindustrial			Derivation of Management Option 2 RS					
Revision Date: 08/04/2003			Run date:	10/17/2003				
INPUTS TO SOIL PATICULATE EMISSION MODEL-NONINDUSTRIAL					Site-Specific			
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s		
mean annual windspeed				Um =	4.69	m/s		
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet			
fraction of vegetative cover				V =	0.5	unitless		
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless		
x = 0.886*(Ut/Um)								
for x<0.5	F(x) =	1.91						
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x						
for 0.8<x<1	F(x) =	2.6 - x						
for 1<x<2	F(x) =	2.9 - 1.3*x						
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)						
PEFni = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))								
DA & VF calculations are in the Soilni worksheet								
Soilni-PEF-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj*(1/VFnia+1/PEFni)+SFo*1e-6*ABS*IRDadj))								
Soilni-PEF-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj/PEFni+SFo*1e-6*ABS*IRDadj))								
Soilni-PEF-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic+1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))								
Soilni-PEF-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))								
	PEFni	Soilni-PEF	Soilni-PEF	Soilni-PEF	Soilni-PEF	min value		
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)		
Methoxychlor	1.11E+09	#VALUE!		3.01E+02		3.0E+02		
Methylene chloride	1.11E+09	1.87E+01		2.02E+03		1.9E+01		
Methyl ethyl ketone	1.11E+09	#VALUE!		5.91E+03		5.9E+03		
Methyl isobutyl ketone	1.11E+09	#VALUE!		4.46E+03		4.5E+03		
Methylnaphthalene,2-	1.11E+09	#VALUE!		2.22E+02		2.2E+02		
MTBE (methyl tert-butyl ether)	1.11E+09	#VALUE!		6.54E+03		6.5E+03		
Naphthalene	1.11E+09	#VALUE!		6.20E+01		6.2E+01		
Nickel	1.11E+09		#VALUE!		#VALUE!	#VALUE!		
Nitrate	1.11E+09		#VALUE!		1.25E+05	1.3E+05		
Nitrite	1.11E+09		#VALUE!		7.82E+03	7.8E+03		
Nitroaniline,2-	1.11E+09	#VALUE!		7.80E-01		7.8E-01		
Nitroaniline,3-	1.11E+09	#VALUE!		1.29E+02		1.3E+02		
Nitroaniline,4-	1.11E+09	#VALUE!		1.05E+02		1.0E+02		
Nitrobenzene	1.11E+09	#VALUE!		2.19E+01		2.2E+01		
Nitrophenol,4-	1.11E+09	#VALUE!		3.21E+02		3.2E+02		
Nitrosodi-n-propylamine,n-	1.11E+09	4.42E-02		#VALUE!		4.4E-02		
N-nitrosodiphenylamine	1.11E+09	9.05E+01		#VALUE!		9.0E+01		
Pentachlorophenol	1.11E+09	2.78E+00		1.27E+03		2.8E+00		
Phenanthrene	1.11E+09	#VALUE!		2.11E+04		2.1E+04		
Phenol	1.11E+09	#VALUE!		1.29E+04		1.3E+04		
Polychlorinated biphenyls	1.11E+09	2.11E-01		1.06E+00		2.1E-01		
Pyrene	1.11E+09	#VALUE!		2.29E+03		2.3E+03		

LDEQ RECAP
WORKSHEET 9
SOILni-PEF
(mg/kg)

Soil with particulate emissions-Nonindustrial			Derivation of Management Option 2 RS					
Revision Date: 08/04/2003			Run date:	10/17/2003				
INPUTS TO SOIL PATICULATE EMISSION MODEL-NONINDUSTRIAL					Site-Specific			
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s		
mean annual windspeed				Um =	4.69	m/s		
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet			
fraction of vegetative cover				V =	0.5	unitless		
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless		
x = 0.886*(Ut/Um)								
for x<0.5	F(x) =	1.91						
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x						
for 0.8<x<1	F(x) =	2.6 - x						
for 1<x<2	F(x) =	2.9 - 1.3*x						
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)						
PEFni = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))								
DA & VF calculations are in the Soilni worksheet								
Soilni-PEF-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj*(1/VFnia+1/PEFni)+SFo*1e-6*ABS*IRDadj))								
Soilni-PEF-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj/PEFni+SFo*1e-6*ABS*IRDadj))								
Soilni-PEF-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic+1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))								
Soilni-PEF-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))								
	PEFni	Soilni-PEF	Soilni-PEF	Soilni-PEF	Soilni-PEF	min value		
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)		
Selenium	1.11E+09		#VALUE!		#VALUE!	#VALUE!		
Silver	1.11E+09		#VALUE!		#VALUE!	#VALUE!		
Styrene	1.11E+09	#VALUE!		4.96E+03		5.0E+03		
Tetrachlorobenzene,1,2,4,5-	1.11E+09	#VALUE!		1.19E+01		1.2E+01		
Tetrachloroethane,1,1,1,2-	1.11E+09	2.75E+00		2.28E+02		2.7E+00		
Tetrachloroethane,1,1,2,2-	1.11E+09	8.10E-01		1.07E+03		8.1E-01		
Tetrachloroethylene	1.11E+09	8.33E+00		3.41E+02		8.3E+00		
Tetrachlorophenol,2,3,4,6-	1.11E+09	#VALUE!		1.44E+03		1.4E+03		
Thallium	1.11E+09		#VALUE!		#VALUE!	#VALUE!		
Toluene	1.11E+09	#VALUE!		6.76E+02		6.8E+02		
Toxaphene	1.11E+09	4.38E-01		#VALUE!		4.4E-01		
Trichlorobenzene,1,2,4-	1.11E+09	#VALUE!		6.58E+02		6.6E+02		
Trichloroethane,1,1,1-	1.11E+09	#VALUE!		8.19E+02		8.2E+02		
Trichloroethane,1,1,2-	1.11E+09	1.90E+00		4.59E+01		1.9E+00		
Trichloroethene	1.11E+09	9.98E-02		1.61E+01		1.0E-01		
Trichlorofluoromethane	1.11E+09	#VALUE!		3.84E+02		3.8E+02		
Trichlorophenol,2,4,5-	1.11E+09	#VALUE!		5.27E+03		5.3E+03		
Trichlorophenol,2,4,6-	1.11E+09	3.97E+01		#VALUE!		4.0E+01		
Vanadium	1.11E+09		#VALUE!		#VALUE!	#VALUE!		
Vinyl chloride	1.11E+09	2.38E-01		3.91E+01		2.4E-01		
Xylene(mixed)	1.11E+09	#VALUE!		1.79E+02		1.8E+02		
Zinc	1.11E+09		#VALUE!		2.35E+04	2.3E+04		

LDEQ RECAP
WORKSHEET 9
SOILni-PEF
(mg/kg)

Soil with particulate emissions-Nonindustrial — Derivation of Management Option 2 RS

Revision Date: 08/04/2003 — Run date: 10/17/2003

INPUTS TO SOIL PATICULATE EMISSION MODEL-NONINDUSTRIAL		Site-Specific	
equivalent threshold value of windspeed at 7m	Ut =	11.32	m/s
mean annual windspeed	Um =	4.69	m/s
inverse of mean concentration at enter of source (g/m2-s per kg/m3)	Q/C =	enter in soil properties spreadsheet	
fraction of vegetative cover	V =	0.5	unitless
function dependent on Um/Ut - See Below	F(x) =	0.194	unitless

x = 0.886*(Ut/Um)

for x<0.5	F(x) =	1.91
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x
for 0.8<x<1	F(x) =	2.6 - x
for 1<x<2	F(x) =	2.9 - 1.3*x
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)

PEFni = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))

DA & VF calculations are in the Soilni worksheet

Soilni-PEF-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj*(1/VFnia+1/PEFni)+SFo*1e-6*ABS*IRDadj))

Soilni-PEF-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*IRAadj/PEFni+SFo*1e-6*ABS*IRDadj))

Soilni-PEF-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic+1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))

Soilni-PEF-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/PEFni)+(SAc/RfDo)*AFc*ABS*1e-6))

COMPOUND	PEFni (m3/kg)	Soilni-PEF C-O (mg/kg)	Soilni-PEF C-I (mg/kg)	Soilni-PEF N-O (mg/kg)	Soilni-PEF N-I (mg/kg)	min value (C or N)
Aliphatics C6-C8	1.11E+09	#VALUE!		1.18E+04		1.2E+04
Aliphatics >C8-C10	1.11E+09	#VALUE!		1.18E+03		1.2E+03
Aliphatics >C10-C12	1.11E+09	#VALUE!		2.29E+03		2.3E+03
Aliphatics >C12-C16	1.11E+09	#VALUE!		3.68E+03		3.7E+03
Aliphatics >C16-C35	1.11E+09	#VALUE!		7.09E+04		7.1E+04
Aromatics >C8-C10	1.11E+09	#VALUE!		6.49E+02		6.5E+02
Aromatics >C10-C12	1.11E+09	#VALUE!		1.18E+03		1.2E+03
Aromatics >C12-C16	1.11E+09	#VALUE!		1.82E+03		1.8E+03
Aromatics >C16-C21	1.11E+09	#VALUE!		1.48E+03		1.5E+03
Aromatics >C21-C35	1.11E+09	#VALUE!		1.79E+03		1.8E+03
TPH-GRO (C6-C10)						6.5E+02
TPH-DRO (C10-C28)						6.5E+02
TPH-ORO (>C28)						1.8E+03

Soil with particulate emissions-Industrial			Derivation of Management Option 2 RS				
Revision Date: 08/04/2003			Run date:	10/17/2003			
INPUTS TO SOIL PATICULATE EMISSION MODEL-INDUSTRIAL					Site-Specific		
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s	
mean annual windspeed				Um =	4.69	m/s	
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet		
fraction of vegetative cover				V =	0	unitless	
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless	
x = 0.886*(Ut/Um)							
for x<0.5	F(x) =	1.91					
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x					
for 0.8<x<1	F(x) =	2.6 - x					
for 1<x<2	F(x) =	2.9 - 1.3*x					
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)					
PEFi = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))							
DA & VF calculations are in the Soili worksheet							
Soili-PEF-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa*(1/VFi+1/PEFi)+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa/PEFi+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi+1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
Soili-PEF-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
	PEFi	Soili-PEF	Soili-PEF	Soili-PEF	Soili-PEF	min value	
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)	
Acenaphthene	5.53E+08	#VALUE!		6.12E+04		6.1E+04	
Acenaphthylene	5.53E+08	#VALUE!		5.14E+04		5.1E+04	
Acetone	5.53E+08	#VALUE!		1.39E+04		1.4E+04	
Aldrin	5.53E+08	1.34E-01		2.44E+01		1.3E-01	
Aniline	5.53E+08	1.75E+02		1.67E+02		1.7E+02	
Anthracene	5.53E+08	#VALUE!		4.78E+05		4.8E+05	
Antimony	5.53E+08		#VALUE!		8.17E+02	8.2E+02	
Arsenic	5.53E+08	#VALUE!	2.72E+00		4.39E+02	2.7E+00	
Barium	5.53E+08	#VALUE!	#VALUE!		1.06E+05	1.1E+05	
Benzene	5.53E+08	3.08E+00		2.70E+02		3.1E+00	
Benz(a)anthracene	5.53E+08	2.87E+00		#VALUE!		2.9E+00	
Benzo(a)pyrene	5.53E+08	2.88E-01		#VALUE!		2.9E-01	
Benzo(b)fluoranthene	5.53E+08	2.87E+00		#VALUE!		2.9E+00	
Benzo(k)fluoranthene	5.53E+08	2.88E+01		#VALUE!		2.9E+01	
Beryllium	5.53E+08		#VALUE!		3.26E+03	3.3E+03	
Biphenyl,1,1-	5.53E+08	#VALUE!		4.42E+04		4.4E+04	
Bis(2-chloroethyl)ether	5.53E+08	1.08E+00		#VALUE!		1.1E+00	
Bis(2-chloroisopropyl)ether	5.53E+08	1.67E+01		9.28E+03		1.7E+01	
Bis(2-ethyl-hexyl)phthalate	5.53E+08	1.73E+02		1.73E+04		1.7E+02	
Bromodichloromethane	5.53E+08	4.20E+00		1.86E+03		4.2E+00	
Bromoform	5.53E+08	1.75E+02		5.50E+03		1.8E+02	
Bromomethane	5.53E+08	#VALUE!		2.98E+01		3.0E+01	

LDEQ RECAP
WORKSHEET 10
SOILi-PEF
(mg/kg)

Soil with particulate emissions-Industrial			Derivation of Management Option 2 RS				
Revision Date: 08/04/2003			Run date:	10/17/2003			
INPUTS TO SOIL PATICULATE EMISSION MODEL-INDUSTRIAL					Site-Specific		
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s	
mean annual windspeed				Um =	4.69	m/s	
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet		
fraction of vegetative cover				V =	0	unitless	
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless	
x = 0.886*(Ut/Um)							
for x<0.5	F(x) =	1.91					
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x					
for 0.8<x<1	F(x) =	2.6 - x					
for 1<x<2	F(x) =	2.9 - 1.3*x					
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)					
PEFi = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))							
DA & VF calculations are in the Soili worksheet							
Soili-PEF-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa*(1/VFi+1/PEFi)+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa/PEFi+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi+1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
Soili-PEF-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
	PEFi	Soili-PEF	Soili-PEF	Soili-PEF	Soili-PEF	min value	
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)	
Butyl benzyl phthalate	5.53E+08	#VALUE!		1.66E+05		1.7E+05	
Cadmium	5.53E+08		#VALUE!		1.00E+03	1.0E+03	
Carbon Disulfide	5.53E+08	#VALUE!		2.51E+03		2.5E+03	
Carbon Tetrachloride	5.53E+08	1.14E+00		1.25E+01		1.1E+00	
Chlordane	5.53E+08	9.97E+00		5.65E+02		1.0E+01	
Chloroaniline,p-	5.53E+08	#VALUE!		1.69E+03		1.7E+03	
Chlorobenzene	5.53E+08	#VALUE!		1.22E+03		1.2E+03	
Chlorodibromomethane	5.53E+08	5.43E+00		3.26E+03		5.4E+00	
Chloroethane (Ethylchloride)	5.53E+08	8.23E+00		2.38E+04		8.2E+00	
Chloroform	5.53E+08	1.20E+00		2.96E+00		1.2E+00	
Chloromethane	5.53E+08	7.27E+00		1.42E+03		7.3E+00	
Chloronaphthalene,2-	5.53E+08	#VALUE!		8.32E+04		8.3E+04	
Chlorophenol,2-	5.53E+08	#VALUE!		1.45E+03		1.4E+03	
Chromium(III)	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Chromium(VI)	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Chrysene	5.53E+08	2.85E+02		#VALUE!		2.9E+02	
Cobalt	5.53E+08		#VALUE!		1.42E+04	1.4E+04	
Copper	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Cyanide (free)	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
DDD	5.53E+08	1.61E+01		#VALUE!		1.6E+01	
DDE	5.53E+08	1.14E+01		#VALUE!		1.1E+01	
DDT	5.53E+08	1.19E+01		7.20E+02		1.2E+01	

LDEQ RECAP
WORKSHEET 10
SOILi-PEF
(mg/kg)

Soil with particulate emissions-Industrial			Derivation of Management Option 2 RS				
Revision Date: 08/04/2003			Run date:	10/17/2003			
INPUTS TO SOIL PATICULATE EMISSION MODEL-INDUSTRIAL					Site-Specific		
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s	
mean annual windspeed				Um =	4.69	m/s	
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet		
fraction of vegetative cover				V =	0	unitless	
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless	
x = 0.886*(Ut/Um)							
for x<0.5	F(x) =	1.91					
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x					
for 0.8<x<1	F(x) =	2.6 - x					
for 1<x<2	F(x) =	2.9 - 1.3*x					
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)					
PEFi = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))							
DA & VF calculations are in the Soili worksheet							
Soili-PEF-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa*(1/VFi+1/PEFi)+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa/PEFi+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi+1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
Soili-PEF-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
	PEFi	Soili-PEF	Soili-PEF	Soili-PEF	Soili-PEF	min value	
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)	
Dibenz(a,h)anthracene	5.53E+08	2.88E-01		#VALUE!		2.9E-01	
Dibenzofuran	5.53E+08	#VALUE!		6.47E+03		6.5E+03	
Dibromo-3-chloropropane,1,2-	5.53E+08	1.76E+00		1.62E+01		1.8E+00	
Dichlorobenzene,1,2-	5.53E+08	#VALUE!		7.40E+03		7.4E+03	
Dichlorobenzene,1,3-	5.53E+08	#VALUE!		1.79E+02		1.8E+02	
Dichlorobenzene,1,4-	5.53E+08	1.64E+01		2.21E+04		1.6E+01	
Dichlorobenzidine,3,3-	5.53E+08	4.21E+00		#VALUE!		4.2E+00	
Dichloroethane,1,1-	5.53E+08	#VALUE!		4.66E+03		4.7E+03	
Dichloroethane,1,2-	5.53E+08	1.76E+00		1.66E+02		1.8E+00	
Dichloroethene,1,1-	5.53E+08	#VALUE!		9.09E+02		9.1E+02	
Dichloroethene,cis,1,2-	5.53E+08	#VALUE!		3.36E+02		3.4E+02	
Dichloroethene,trans,1,2-	5.53E+08	#VALUE!		4.77E+02		4.8E+02	
Dichlorophenol,2,4-	5.53E+08	#VALUE!		1.98E+03		2.0E+03	
Dichloropropane,1,2-	5.53E+08	1.76E+00		4.86E+01		1.8E+00	
Dichloropropene,1,3-	5.53E+08	9.96E+00		3.42E+02		1.0E+01	
Dieldrin	5.53E+08	1.46E-01		4.18E+01		1.5E-01	
Diethylphthalate	5.53E+08	#VALUE!		3.93E+05		3.9E+05	
Dimethylphenol,2,4-	5.53E+08	#VALUE!		1.06E+04		1.1E+04	
Dimethylphthalate	5.53E+08	#VALUE!		4.39E+06		4.4E+06	
Di-n-octylphthalate	5.53E+08	#VALUE!		3.51E+04		3.5E+04	
Dinitrobenzene,1,3-	5.53E+08	#VALUE!		4.95E+01		5.0E+01	
Dinitrophenol,2,4-	5.53E+08	#VALUE!		6.91E+02		6.9E+02	

LDEQ RECAP
WORKSHEET 10
SOILi-PEF
(mg/kg)

Soil with particulate emissions-Industrial			Derivation of Management Option 2 RS				
Revision Date: 08/04/2003			Run date:	10/17/2003			
INPUTS TO SOIL PATICULATE EMISSION MODEL-INDUSTRIAL					Site-Specific		
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s	
mean annual windspeed				Um =	4.69	m/s	
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet		
fraction of vegetative cover				V =	0	unitless	
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless	
x = 0.886*(Ut/Um)							
for x<0.5	F(x) =	1.91					
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x					
for 0.8<x<1	F(x) =	2.6 - x					
for 1<x<2	F(x) =	2.9 - 1.3*x					
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)					
PEFi = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))							
DA & VF calculations are in the Soili worksheet							
Soili-PEF-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa*(1/VFi+1/PEFi)+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa/PEFi+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi+1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
Soili-PEF-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
	PEFi	Soili-PEF	Soili-PEF	Soili-PEF	Soili-PEF	min value	
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)	
Dinitrotoluene,2,6-	5.53E+08	#VALUE!		4.59E+02		4.6E+02	
Dinitrotoluene,2,4-	5.53E+08	#VALUE!		9.83E+02		9.8E+02	
Dinoseb	5.53E+08	#VALUE!		5.38E+02		5.4E+02	
Endosulfan	5.53E+08	#VALUE!		4.50E+03		4.5E+03	
Endrin	5.53E+08	#VALUE!		2.46E+02		2.5E+02	
Ethyl benzene	5.53E+08	#VALUE!		1.29E+04		1.3E+04	
Fluoranthene	5.53E+08	#VALUE!		2.88E+04		2.9E+04	
Fluorene	5.53E+08	#VALUE!		5.40E+04		5.4E+04	
Heptachlor	5.53E+08	3.54E-02		2.88E+01		3.5E-02	
Heptachlor epoxide	5.53E+08	2.64E-01		1.12E+01		2.6E-01	
Hexachlorobenzene	5.53E+08	1.99E+00		9.13E+02		2.0E+00	
Hexachlorobutadiene	5.53E+08	1.55E+01		8.60E+01		1.6E+01	
Hexachlorocyclohexane,alpha	5.53E+08	4.41E-01		#VALUE!		4.4E-01	
Hexachlorocyclohexane,beta	5.53E+08	1.62E+00		#VALUE!		1.6E+00	
Hexachlorocyclohexane,gamma	5.53E+08	2.05E+00		2.85E+02		2.0E+00	
Hexachlorocyclopentadiene	5.53E+08	#VALUE!		9.40E+01		9.4E+01	
Hexachloroethane	5.53E+08	1.37E+02		6.84E+02		1.4E+02	
Indeno(1,2,3-cd)pyrene	5.53E+08	2.88E+00		#VALUE!		2.9E+00	
Isobutyl alcohol	5.53E+08	#VALUE!		6.23E+04		6.2E+04	
Isophorone	5.53E+08	1.11E+03		7.53E+04		1.1E+03	
Lead (inorganic)	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Mercury (inorganic)	5.53E+08		#VALUE!		6.12E+02	6.1E+02	

LDEQ RECAP
WORKSHEET 10
SOILi-PEF
(mg/kg)

Soil with particulate emissions-Industrial			Derivation of Management Option 2 RS				
Revision Date: 08/04/2003			Run date:	10/17/2003			
INPUTS TO SOIL PATICULATE EMISSION MODEL-INDUSTRIAL					Site-Specific		
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s	
mean annual windspeed				Um =	4.69	m/s	
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet		
fraction of vegetative cover				V =	0	unitless	
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless	
x = 0.886*(Ut/Um)							
for x<0.5	F(x) =	1.91					
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x					
for 0.8<x<1	F(x) =	2.6 - x					
for 1<x<2	F(x) =	2.9 - 1.3*x					
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)					
PEFi = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))							
DA & VF calculations are in the Soili worksheet							
Soili-PEF-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa*(1/VFi+1/PEFi)+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa/PEFi+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi+1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
Soili-PEF-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
	PEFi	Soili-PEF	Soili-PEF	Soili-PEF	Soili-PEF	min value	
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)	
Methoxychlor	5.53E+08	#VALUE!		4.27E+03		4.3E+03	
Methylene chloride	5.53E+08	4.43E+01		1.98E+04		4.4E+01	
Methyl ethyl ketone	5.53E+08	#VALUE!		4.35E+04		4.4E+04	
Methyl isobutyl ketone	5.53E+08	#VALUE!		6.35E+04		6.3E+04	
Methylnaphthalene,2-	5.53E+08	#VALUE!		1.65E+03		1.7E+03	
MTBE (methyl tert-butyl ether)	5.53E+08	#VALUE!		4.71E+04		4.7E+04	
Naphthalene	5.53E+08	#VALUE!		4.26E+02		4.3E+02	
Nickel	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Nitrate	5.53E+08		#VALUE!		3.27E+06	3.3E+06	
Nitrite	5.53E+08		#VALUE!		2.04E+05	2.0E+05	
Nitroaniline,2-	5.53E+08	#VALUE!		5.22E+00		5.2E+00	
Nitroaniline,3-	5.53E+08	#VALUE!		1.45E+03		1.4E+03	
Nitroaniline,4-	5.53E+08	#VALUE!		1.01E+03		1.0E+03	
Nitrobenzene	5.53E+08	#VALUE!		2.50E+02		2.5E+02	
Nitrophenol,4-	5.53E+08	#VALUE!		3.31E+03		3.3E+03	
Nitrosodi-n-propylamine,n-	5.53E+08	1.42E-01		#VALUE!		1.4E-01	
N-nitrosodiphenylamine	5.53E+08	4.02E+02		#VALUE!		4.0E+02	
Pentachlorophenol	5.53E+08	9.73E+00		1.25E+04		9.7E+00	
Phenanthrene	5.53E+08	#VALUE!		4.25E+05		4.3E+05	
Phenol	5.53E+08	#VALUE!		1.45E+05		1.5E+05	
Polychlorinated biphenyls	5.53E+08	8.98E-01		1.28E+01		9.0E-01	
Pyrene	5.53E+08	#VALUE!		5.60E+04		5.6E+04	

LDEQ RECAP
WORKSHEET 10
SOILi-PEF
(mg/kg)

Soil with particulate emissions-Industrial			Derivation of Management Option 2 RS				
Revision Date: 08/04/2003			Run date:	10/17/2003			
INPUTS TO SOIL PATICULATE EMISSION MODEL-INDUSTRIAL					Site-Specific		
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s	
mean annual windspeed				Um =	4.69	m/s	
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet		
fraction of vegetative cover				V =	0	unitless	
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless	
x = 0.886*(Ut/Um)							
for x<0.5	F(x) =	1.91					
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x					
for 0.8<x<1	F(x) =	2.6 - x					
for 1<x<2	F(x) =	2.9 - 1.3*x					
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)					
PEFi = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))							
DA & VF calculations are in the Soili worksheet							
Soili-PEF-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa*(1/VFi+1/PEFi)+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa/PEFi+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi+1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
Soili-PEF-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
	PEFi	Soili-PEF	Soili-PEF	Soili-PEF	Soili-PEF	min value	
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)	
Selenium	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Silver	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Styrene	5.53E+08	#VALUE!		4.33E+04		4.3E+04	
Tetrachlorobenzene,1,2,4,5-	5.53E+08	#VALUE!		1.22E+02		1.2E+02	
Tetrachloroethane,1,1,1,2-	5.53E+08	5.92E+00		1.64E+03		5.9E+00	
Tetrachloroethane,1,1,2,2-	5.53E+08	1.98E+00		8.63E+03		2.0E+00	
Tetrachloroethylene	5.53E+08	3.47E+01		3.37E+03		3.5E+01	
Tetrachlorophenol,2,3,4,6-	5.53E+08	#VALUE!		1.65E+04		1.7E+04	
Thallium	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Toluene	5.53E+08	#VALUE!		4.66E+03		4.7E+03	
Toxaphene	5.53E+08	2.19E+00		#VALUE!		2.2E+00	
Trichlorobenzene,1,2,4-	5.53E+08	#VALUE!		1.17E+04		1.2E+04	
Trichloroethane,1,1,1-	5.53E+08	#VALUE!		7.03E+03		7.0E+03	
Trichloroethane,1,1,2-	5.53E+08	4.29E+00		3.44E+02		4.3E+00	
Trichloroethene	5.53E+08	2.06E-01		2.19E+02		2.1E-01	
Trichlorofluoromethane	5.53E+08	#VALUE!		2.59E+03		2.6E+03	
Trichlorophenol,2,4,5-	5.53E+08	#VALUE!		6.55E+04		6.6E+04	
Trichlorophenol,2,4,6-	5.53E+08	1.73E+02		#VALUE!		1.7E+02	
Vanadium	5.53E+08		#VALUE!		#VALUE!	#VALUE!	
Vinyl chloride	5.53E+08	7.86E-01		2.98E+02		7.9E-01	
Xylene(mixed)	5.53E+08	#VALUE!		1.21E+03		1.2E+03	
Zinc	5.53E+08		#VALUE!		6.13E+05	6.1E+05	

LDEQ RECAP
WORKSHEET 10
SOILi-PEF
(mg/kg)

Soil with particulate emissions-Industrial			Derivation of Management Option 2 RS				
Revision Date: 08/04/2003			Run date:	10/17/2003			
INPUTS TO SOIL PATICULATE EMISSION MODEL-INDUSTRIAL					Site-Specific		
equivalent threshold value of windspeed at 7m				Ut =	11.32	m/s	
mean annual windspeed				Um =	4.69	m/s	
inverse of mean concentration at enter of source (g/m2-s per kg/m3)				Q/C =	enter in soil properties spreadsheet		
fraction of vegetative cover				V =	0	unitless	
function dependent on Um/Ut - See Below				F(x) =	0.194	unitless	
x = 0.886*(Ut/Um)							
for x<0.5	F(x) =	1.91					
for 0.5<x<0.8	F(x) =	2.06 - 0.33*x					
for 0.8<x<1	F(x) =	2.6 - x					
for 1<x<2	F(x) =	2.9 - 1.3*x					
for x>2	F(x) =	0.18*(8*x^3 + 12*x) e^(-x^2)					
PEFi = Q/C*3600/(0.036*(1-V)*(Um/Ut)^3*F(x))							
DA & VF calculations are in the Soili worksheet							
Soili-PEF-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa*(1/VFi+1/PEFi)+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*IRAa/PEFi+SFo*SAai*AFai*ABS*1e-6))							
Soili-PEF-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi+1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
Soili-PEF-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/PEFi)+(SAai/RfDo)*AFai*ABS*1e-6))							
	PEFi	Soili-PEF	Soili-PEF	Soili-PEF	Soili-PEF	min value	
COMPOUND	(m3/kg)	C-O (mg/kg)	C-I (mg/kg)	N-O (mg/kg)	N-I (mg/kg)	(C or N)	
Aliphatics C6-C8	5.53E+08	#VALUE!		8.03E+04		8.0E+04	
Aliphatics >C8-C10	5.53E+08	#VALUE!		8.83E+03		8.8E+03	
Aliphatics >C10-C12	5.53E+08	#VALUE!		1.96E+04		2.0E+04	
Aliphatics >C12-C16	5.53E+08	#VALUE!		3.77E+04		3.8E+04	
Aliphatics >C16-C35	5.53E+08	#VALUE!		6.87E+05		6.9E+05	
Aromatics >C8-C10	5.53E+08	#VALUE!		5.12E+03		5.1E+03	
Aromatics >C10-C12	5.53E+08	#VALUE!		1.10E+04		1.1E+04	
Aromatics >C12-C16	5.53E+08	#VALUE!		2.14E+04		2.1E+04	
Aromatics >C16-C21	5.53E+08	#VALUE!		1.75E+04		1.7E+04	
Aromatics >C21-C35	5.53E+08	#VALUE!		2.52E+04		2.5E+04	
TPH-GRO (C6-C10)						5.1E+03	
TPH-DRO (C10-C28)						5.1E+03	
TPH-ORO (>C28)						2.5E+04	

LDEQ RECAP
WORKSHEET 11
SOILesni
(mg/kg)

Subsurface soil located beneath enclosed structure - Nonindustrial	Derivation of Management Option 2 RS	
Revision Date: 08/04/2003	Run date:	10/17/2003

INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
bgs depth to contaminated subsurface soils	Ls =	100	cm
enclosed-structure air exchange rate	ER =	0.00014	1/s
enclosed-structure volume/infiltration area ratio	Lb =	200	cm
enclosed-structure foundation or wall thickness	Lcrack =	15	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2

VFsoilesni = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)

Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

Soilesni = Cani*0.001/VFsoilesni

COMPOUND	Ds (cm2/s)	Dcrack (cm2/s)	VFsoilesni (mg/m3/mg/kg	Cani C-O (ug/m3)	Cani N-O (ug/m3)	Soilesni C-O(mg/kg)	Soilesni N-O(mg/kg)	min value (C or N)	Note
Acenaphthene	6.24E-04	6.24E-04	3.00E-06	#VALUE!	2.19E+02	#VALUE!	7.31E+04	7.3E+04	J
Acenaphthylene	6.65E-04	6.65E-04	5.73E-06	#VALUE!	2.19E+02	#VALUE!	3.82E+04	3.8E+04	J
Acetone	1.99E-03	1.99E-03	5.56E-04	#VALUE!	3.65E+02	#VALUE!	6.56E+02	6.6E+02	J
Aldrin									
Aniline									
Anthracene	5.65E-04	5.65E-04	2.38E-07	#VALUE!	1.10E+03	#VALUE!	4.60E+06	4.6E+06	J
Antimony									
Arsenic									
Barium									
Benzene	1.20E-03	1.20E-03	1.18E-02	1.20E+01		1.01E+00		1.0E+00	K
Benz(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Beryllium									
Biphenyl,1,1-	5.77E-04	5.77E-04	5.13E-06		2.38E+01		4.64E+03	4.6E+03	K
Bis(2-chloroethyl)ether	1.38E-03	1.38E-03	3.92E-05	3.00E-01		7.65E+00		7.6E+00	K
Bis(2-chloroisopropyl)ether	8.69E-04	8.69E-04	1.82E-04	1.90E-01	1.46E+02	1.04E+00	8.02E+02	1.0E+00	J
Bis(2-ethyl-hexyl)phthalate									
Bromodichloromethane	4.12E-04	4.12E-04	1.31E-03	1.07E-01	7.30E+01	8.16E-02	5.56E+01	8.2E-02	J
Bromoform	2.23E-04	2.23E-04	1.24E-04	1.72E+00	7.30E+01	1.39E+01	5.91E+02	1.4E+01	J
Bromomethane	9.90E-04	9.90E-04	2.81E-02	#VALUE!	5.22E+00	#VALUE!	1.86E-01	1.9E-01	J
Butyl benzyl phthalate									
Cadmium									
Carbon Disulfide	1.41E-03	1.41E-03	7.74E-02		7.14E+01		9.23E-01	9.2E-01	K
Carbon Tetrachloride	1.06E-03	1.06E-03	2.58E-02	6.67E+00		2.59E-01		2.6E-01	K
Chlordane									
Chloroaniline,p-									
Chlorobenzene	9.94E-04	9.94E-04	2.27E-03		1.10E+03		4.84E+02	4.8E+02	K
Chlorodibromomethane	2.80E-04	2.80E-04	3.98E-04	7.90E-02	7.30E+01	1.99E-01	1.84E+02	2.0E-01	J
Chloroethane (Ethylchloride)	3.68E-03	3.68E-03	1.70E-01		6.29E+04		3.70E+02	3.7E+02	K

LDEQ RECAP
WORKSHEET 11
SOILesni
(mg/kg)

Subsurface soil located beneath enclosed structure - Nonindustrial					Derivation of Management Option 2 RS				
Revision Date: 08/04/2003					Run date:	10/17/2003			
INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL						Site-Specific			
volumetric air content in foundation/wall cracks					nacrack =	0.14849057	cm3-air/cm3-total vol		
volumetric water content in foundation/wall cracks					nwcrack =	0.21	cm3-water/cm3-total vol		
total porosity of foundation/wall cracks					nf =	0.35849057	cm3/cm3		
bgs depth to contaminated subsurface soils					Ls =	100	cm		
enclosed-structure air exchange rate					ER =	0.00014	1/s		
enclosed-structure volume/infiltration area ratio					Lb =	200	cm		
enclosed-structure foundation or wall thickness					Lcrack =	15	cm		
areal fraction of cracks in foundation/walls					FC =	0.01	cm2-cracks/cm2-total area		
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2									
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2									
VFsoilesni = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000									
Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)									
Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)									
Soilesni = Cani*0.001/VFsoilesni									
	Ds	Dcrack	VFsoilesni	Cani	Cani	Soilesni	Soilesni	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(mg/m3/mg/kg	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/kg)	N-O(mg/kg)	(C or N)	
Chloroform	1.41E-03	1.41E-03	1.05E-02	4.30E+00		4.09E-01		4.1E-01	K
Chloromethane	1.71E-03	1.71E-03	4.51E-02	5.56E+01		1.23E+00		1.2E+00	K
Chloronaphthalene,2-	5.01E-04	5.01E-04	2.78E-06	#VALUE!	2.92E+02	#VALUE!	1.05E+05	1.1E+05	J
Chlorophenol,2-	7.06E-04	7.06E-04	1.10E-04	#VALUE!	1.83E+01	#VALUE!	1.66E+02	1.7E+02	J
Chromium(III)									
Chromium(VI)									
Chrysene									
Cobalt									
Copper									
Cyanide (free)									
DDD									
DDE									
DDT									
Dibenz(a,h)anthracene									
Dibenzofuran	8.47E-04	8.47E-04	2.06E-07	#VALUE!	1.46E+01	#VALUE!	7.08E+04	7.1E+04	J
Dibromo-3-chloropropane,1,2-									
Dichlorobenzene,1,2-	9.41E-04	9.41E-04	6.81E-04	#VALUE!	2.08E+02	#VALUE!	3.06E+02	3.1E+02	J
Dichlorobenzene,1,3-	8.74E-04	8.74E-04	2.55E-04	#VALUE!	3.29E+00	#VALUE!	1.29E+01	1.3E+01	J
Dichlorobenzene,1,4-	9.40E-04	9.40E-04	5.46E-04		1.43E+03		2.62E+03	2.6E+03	K
Dichlorobenzidine,3,3-									
Dichloroethane,1,1-	1.01E-03	1.01E-03	1.12E-02	#VALUE!	5.22E+02	#VALUE!	4.67E+01	4.7E+01	J
Dichloroethane,1,2-	1.42E-03	1.42E-03	3.59E-03	3.85E+00		1.07E+00		1.1E+00	K
Dichloroethene,1,1-	1.22E-03	1.22E-03	4.81E-02	#VALUE!	2.08E+02	#VALUE!	4.33E+00	4.3E+00	J
Dichloroethene,cis,1,2-	1.00E-03	1.00E-03	1.07E-02	#VALUE!	3.65E+01	#VALUE!	3.43E+00	3.4E+00	J
Dichloroethene,trans,1,2-	9.61E-04	9.61E-04	2.14E-02	#VALUE!	7.30E+01	#VALUE!	3.41E+00	3.4E+00	J
Dichlorophenol,2,4-									
Dichloropropane,1,2-	1.06E-03	1.06E-03	6.57E-03		8.26E+03		1.26E+03	1.3E+03	K
Dichloropropene,1,3-	8.56E-04	8.56E-04	3.43E-03		1.07E+02		3.12E+01	3.1E+01	K
Dieldrin									
Diethylphthalate									
Dimethylphenol,2,4-									

Subsurface soil located beneath enclosed structure - Nonindustrial		Derivation of Management Option 2 RS	
Revision Date: 08/04/2003		Run date:	10/17/2003
INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
bgs depth to contaminated subsurface soils	Ls =	100	cm
enclosed-structure air exchange rate	ER =	0.00014	1/s
enclosed-structure volume/infiltration area ratio	Lb =	200	cm
enclosed-structure foundation or wall thickness	Lcrack =	15	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2

VFsoilesni = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)

Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

Soilesni = Cani*0.001/VFsoilesni

	Ds	Dcrack	VFsoilesni	Cani	Cani	Soilesni	Soilesni	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(mg/m3/mg/kg	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/kg)	N-O(mg/kg)	(C or N)	
Dimethylphthalate									
Di-n-octylphthalate									
Dinitrobenzene,1,3-									
Dinitrophenol,2,4-									
Dinitrotoluene,2,6-									
Dinitrotoluene,2,4-									
Dinoseb									
Endosulfan									
Endrin									
Ethyl benzene	1.02E-03	1.02E-03	5.34E-03		1.03E+04		1.93E+03	1.9E+03	K
Fluoranthene									
Fluorene	6.23E-04	6.23E-04	7.82E-07	#VALUE!	1.46E+02	#VALUE!	1.87E+05	1.9E+05	J
Heptachlor									
Heptachlor epoxide									
Hexachlorobenzene	7.41E-04	7.41E-04	1.86E-06	2.00E-01		1.07E+02		1.1E+02	K
Hexachlorobutadiene									
Hexachlorocyclohexane,alpha									
Hexachlorocyclohexane,beta									
Hexachlorocyclohexane,gamma									
Hexachlorocyclopentadiene	2.19E-04	2.19E-04	4.51E-06	#VALUE!	2.08E-01	#VALUE!	4.62E+01	4.6E+01	J
Hexachloroethane	3.58E-05	3.58E-05	1.18E-05	2.50E+01		2.12E+03		2.1E+03	K
Indeno(1,2,3-cd)pyrene									
Isobutyl alcohol									
Isophorone									
Lead (inorganic)									
Mercury (inorganic)									
Methoxychlor									
Methylene chloride	1.38E-03	1.38E-03	1.64E-02	2.13E+02		1.30E+01		1.3E+01	K
Methyl ethyl ketone	1.28E-03	1.28E-03	5.01E-04		1.40E+04		2.80E+04	2.8E+04	K
Methyl isobutyl ketone	1.08E-03	1.08E-03	8.56E-04		4.88E+03		5.70E+03	5.7E+03	K
Methylnaphthalene,2-	7.94E-04	7.94E-04	3.11E-06	#VALUE!	3.14E+00	#VALUE!	1.01E+03	1.0E+03	J

LDEQ RECAP
WORKSHEET 11
SOILesni
(mg/kg)

Subsurface soil located beneath enclosed structure - Nonindustrial	Derivation of Management Option 2 RS		
Revision Date: 08/04/2003	Run date:	10/17/2003	
INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
bgs depth to contaminated subsurface soils	Ls =	100	cm
enclosed-structure air exchange rate	ER =	0.00014	1/s
enclosed-structure volume/infiltration area ratio	Lb =	200	cm
enclosed-structure foundation or wall thickness	Lcrack =	15	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2

VFsoilesni = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)

Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

Soilesni = Cani*0.001/VFsoilesni

COMPOUND	Ds (cm2/s)	Dcrack (cm2/s)	VFsoilesni (mg/m3/mg/kg	Cani C-O (ug/m3)	Cani N-O (ug/m3)	Soilesni C-O(mg/kg)	Soilesni N-O(mg/kg)	min value (C or N)	Note
MTBE (methyl tert-butyl ether)	1.40E-03	1.40E-03	3.91E-03	#VALUE!	3.13E+03	#VALUE!	8.00E+02	8.0E+02	J
Naphthalene	8.17E-04	8.17E-04	4.97E-05	#VALUE!	3.14E+00	#VALUE!	6.31E+01	6.3E+01	J
Nickel									
Nitrate									
Nitrite									
Nitroaniline,2-	9.76E-04	9.76E-04	3.84E-04	#VALUE!	1.06E-01	#VALUE!	2.75E-01	2.8E-01	J
Nitroaniline,3-	5.38E-02	5.38E-02	3.10E-05	#VALUE!	1.10E+01	#VALUE!	3.53E+02	3.5E+02	J
Nitroaniline,4-									
Nitrobenzene	1.41E-03	1.41E-03	3.69E-05		1.19E+02		3.22E+03	3.2E+03	K
Nitrophenol,4-									
Nitrosodi-n-propylamine,n-									
N-nitrosodiphenylamine									
Pentachlorophenol									
Phenanthrene	7.89E-04	7.89E-04	5.81E-07	#VALUE!	1.10E+03	#VALUE!	1.88E+06	1.9E+06	J
Phenol	2.52E-02	2.52E-02	3.09E-05	#VALUE!	1.10E+03	#VALUE!	3.55E+04	3.5E+04	J
Polychlorinated biphenyls									
Pyrene	1.06E-03	1.06E-03	2.62E-08	#VALUE!	1.10E+02	#VALUE!	4.19E+06	4.2E+06	J
Selenium									
Silver									
Styrene	9.67E-04	9.67E-04	4.34E-04		1.00E+03		2.30E+03	2.3E+03	K
Tetrachlorobenzene,1,2,4,5-									
Tetrachloroethane,1,1,1,2-	8.18E-04	8.18E-04	3.94E-03	1.00E-01		2.54E-02		2.5E-02	K
Tetrachloroethane,1,1,2,2-	9.88E-04	9.88E-04	5.21E-04	1.70E+00		3.26E+00		3.3E+00	K
Tetrachloroethylene	9.78E-04	9.78E-04	9.26E-03	1.10E+02		1.19E+01		1.2E+01	K
Tetrachlorophenol,2,3,4,6-									
Thallium									
Toluene	1.18E-03	1.18E-03	7.28E-03		4.00E+02		5.50E+01	5.5E+01	K
Toxaphene									
Trichlorobenzene,1,2,4-	4.13E-04	4.13E-04	5.33E-05	#VALUE!	2.08E+02	#VALUE!	3.91E+03	3.9E+03	J
Trichloroethane,1,1,1-	1.06E-03	1.06E-03	1.68E-02	#VALUE!	1.04E+03	#VALUE!	6.23E+01	6.2E+01	J
Trichloroethane,1,1,2-	1.07E-03	1.07E-03	1.55E-03	6.30E+00		4.07E+00		4.1E+00	K

LDEQ RECAP
WORKSHEET 11
SOILesni
(mg/kg)

Subsurface soil located beneath enclosed structure - Nonindustrial					Derivation of Management Option 2 RS				
Revision Date: 08/04/2003					Run date:	10/17/2003			
INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL						Site-Specific			
volumetric air content in foundation/wall cracks					nacrack =	0.14849057	cm3-air/cm3-total vol		
volumetric water content in foundation/wall cracks					nwcrack =	0.21	cm3-water/cm3-total vol		
total porosity of foundation/wall cracks					nf =	0.35849057	cm3/cm3		
bgs depth to contaminated subsurface soils					Ls =	100	cm		
enclosed-structure air exchange rate					ER =	0.00014	1/s		
enclosed-structure volume/infiltration area ratio					Lb =	200	cm		
enclosed-structure foundation or wall thickness					Lcrack =	15	cm		
areal fraction of cracks in foundation/walls					FC =	0.01	cm2-cracks/cm2-total area		
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2									
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2									
VFsoilesni = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000									
Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)									
Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)									
Soilesni = Cani*0.001/VFsoilesni									
	Ds	Dcrack	VFsoilesni	Cani	Cani	Soilesni	Soilesni	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(mg/m3/mg/kg	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/kg)	N-O(mg/kg)	(C or N)	
Trichloroethene	1.07E-03	1.07E-03	1.39E-02	5.90E+01		4.23E+00		4.2E+00	K
Trichlorofluoromethane	1.18E-03	1.18E-03	7.36E-02	#VALUE!	7.30E+02	#VALUE!	9.92E+00	9.9E+00	J
Trichlorophenol,2,4,5-									
Trichlorophenol,2,4,6-									
Vanadium									
Vinyl chloride	1.44E-03	1.44E-03	1.07E-01	1.20E+00		1.12E-02		1.1E-02	K
Xylene(mixed)	9.51E-04	9.51E-04	7.16E-03	#VALUE!	1.06E+02	#VALUE!	1.48E+01	1.5E+01	J
Zinc									
Aliphatics C6-C8	1.36E-03	1.36E-03	5.34E-02		1.93E+04		3.62E+02	3.6E+02	J
Aliphatics >C8-C10	1.36E-03	1.36E-03	1.23E-02		1.06E+03		8.60E+01	8.6E+01	J
Aliphatics >C10-C12	1.36E-03	1.36E-03	2.40E-03		1.10E+03		4.57E+02	4.6E+02	J
Aliphatics >C12-C16	1.36E-03	1.36E-03	5.24E-04		1.10E+03		2.09E+03	2.1E+03	J
Aliphatics >C16-C35									
Aromatics >C8-C10	1.36E-03	1.36E-03	1.50E-03		2.19E+02		1.46E+02	1.5E+02	J
Aromatics >C10-C12	1.36E-03	1.36E-03	2.79E-04		2.19E+02		7.84E+02	7.8E+02	J
Aromatics >C12-C16	1.37E-03	1.37E-03	5.34E-05		2.19E+02		4.10E+03	4.1E+03	J
Aromatics >C16-C21									
Aromatics >C21-C35									
TPH-GRO (C6-C10)					2.19E+02			8.6E+01	
TPH-DRO (C10-C28)									
TPH-ORO (>C28)									
J - Risk-based value calculated with one of the equations EQ 56 thru 59.									
K - Louisiana Toxic Air Pollutant Ambient Air Standards (LAC 33:III.5112 Table 51.2).									

LDEQ RECAP
WORKSHEET 12
SOILesi
(mg/kg)

Subsurface soil located beneath enclosed structure-Industrial					Derivation of Management Option 2 RS				
Revision Date: 08/04/2003					Run date:	10/17/2003			
INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL						Site-Specific			
volumetric air content in foundation/wall cracks					nacrack =	0.14849057	cm3-air/cm3-total vol		
volumetric water content in foundation/wall cracks					nwcrack =	0.21	cm3-water/cm3-total vol		
total porosity of foundation/wall cracks					nf =	0.35849057	cm3/cm3		
bgs depth to contaminated subsurface soils					Ls =	100	cm		
enclosed-structure air exahnge rate					ER =	0.00023	1/s		
enclosed-structure volume/infiltration area ratio					Lb =	300	cm		
enclosed-structure foundation or wall thickness					Lcrack =	15	cm		
areal fraction of cracks in foundation/walls					FC =	0.01	cm2-cracks/cm2-total area		
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2									
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2									
VFsoilesi = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000									
Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)									
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)									
Soilesi = Cai*0.001/VFsoilesi									
	Ds	Dcrack	VFsoilesi	Cai	Cai	Soilesi	Soilesi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(mg/m3/mg/kg	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/kg)	N-O(mg/kg)	(C or N)	
Acenaphthene	6.24E-04	6.24E-04	1.22E-06	#VALUE!	3.07E+02	#VALUE!	2.52E+05	2.5E+05	J
Acenaphthylene	6.65E-04	6.65E-04	2.32E-06	#VALUE!	3.07E+02	#VALUE!	1.32E+05	1.3E+05	J
Acetone	1.99E-03	1.99E-03	2.26E-04	#VALUE!	5.11E+02	#VALUE!	2.26E+03	2.3E+03	J
Aldrin									
Aniline									
Anthracene	5.65E-04	5.65E-04	9.66E-08	#VALUE!	1.53E+03	#VALUE!	1.59E+07	1.6E+07	J
Antimony									
Arsenic									
Barium									
Benzene	1.20E-03	1.20E-03	4.80E-03	1.20E+01		2.50E+00		2.5E+00	K
Benz(a)anthracene									
Benzo(a)pyrene									
Benzo(b)fluoranthene									
Benzo(k)fluoranthene									
Beryllium									
Biphenyl,1,1-	5.77E-04	5.77E-04	2.08E-06		2.38E+01		1.14E+04	1.1E+04	K
Bis(2-chloroethyl)ether	1.38E-03	1.38E-03	1.59E-05	3.00E-01		1.88E+01		1.9E+01	K
Bis(2-chloroisopropyl)ether	8.69E-04	8.69E-04	7.38E-05	4.09E-01	2.04E+02	5.54E+00	2.77E+03	5.5E+00	J
Bis(2-ethyl-hexyl)phthalate									
Bromodichloromethane	4.12E-04	4.12E-04	5.32E-04	2.31E-01	1.02E+02	4.33E-01	1.92E+02	4.3E-01	J
Bromoform	2.23E-04	2.23E-04	5.02E-05	3.72E+00	1.02E+02	7.41E+01	2.04E+03	7.4E+01	J
Bromomethane	9.90E-04	9.90E-04	1.14E-02	#VALUE!	7.31E+00	#VALUE!	6.40E-01	6.4E-01	J
Butyl benzyl phthalate									
Cadmium									
Carbon Disulfide	1.41E-03	1.41E-03	3.14E-02		7.14E+01		2.27E+00	2.3E+00	K
Carbon Tetrachloride	1.06E-03	1.06E-03	1.05E-02	6.67E+00		6.38E-01		6.4E-01	K
Chlordane									
Chloroaniline,p-									
Chlorobenzene	9.94E-04	9.94E-04	9.22E-04		1.10E+03		1.19E+03	1.2E+03	K
Chlorodibromomethane	2.80E-04	2.80E-04	1.61E-04	1.70E-01	1.02E+02	1.06E+00	6.33E+02	1.1E+00	J
Chloroethane (Ethylchloride)	3.68E-03	3.68E-03	6.89E-02		6.29E+04		9.12E+02	9.1E+02	K

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SOILesi
(mg/kg)

Subsurface soil located beneath enclosed structure-Industrial						Derivation of Management Option 2 RS				
Revision Date: 08/04/2003						Run date:	10/17/2003			
INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL							Site-Specific			
volumetric air content in foundation/wall cracks						nacrack =	0.14849057	cm3-air/cm3-total vol		
volumetric water content in foundation/wall cracks						nwcrack =	0.21	cm3-water/cm3-total vol		
total porosity of foundation/wall cracks						nf =	0.35849057	cm3/cm3		
bgs depth to contaminated subsurface soils						Ls =	100	cm		
enclosed-structure air exahnge rate						ER =	0.00023	1/s		
enclosed-structure volume/infiltration area ratio						Lb =	300	cm		
enclosed-structure foundation or wall thickness						Lcrack =	15	cm		
areal fraction of cracks in foundation/walls						FC =	0.01	cm2-cracks/cm2-total area		
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2										
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2										
VFsoilesi = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000										
Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)										
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)										
Soilesi = Cai*0.001/VFsoilesi										
	Ds	Dcrack	VFsoilesi	Cai	Cai	Soilesi	Soilesi	min value	Note	
COMPOUND	(cm2/s)	(cm2/s)	(mg/m3/mg/kg	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/kg)	N-O(mg/kg)	(C or N)		
Chloroform	1.41E-03	1.41E-03	4.27E-03	4.30E+00		1.01E+00		1.0E+00	K	
Chloromethane	1.71E-03	1.71E-03	1.83E-02	5.56E+01		3.04E+00		3.0E+00	K	
Chloronaphthalene,2-	5.01E-04	5.01E-04	1.13E-06	#VALUE!	4.09E+02	#VALUE!	3.63E+05	3.6E+05	J	
Chlorophenol,2-	7.06E-04	7.06E-04	4.45E-05	#VALUE!	2.56E+01	#VALUE!	5.74E+02	5.7E+02	J	
Chromium(III)										
Chromium(VI)										
Chrysene										
Cobalt										
Copper										
Cyanide (free)										
DDD										
DDE										
DDT										
Dibenz(a,h)anthracene										
Dibenzofuran	8.47E-04	8.47E-04	8.36E-08	#VALUE!	2.04E+01	#VALUE!	2.44E+05	2.4E+05	J	
Dibromo-3-chloropropane,1,2-										
Dichlorobenzene,1,2-	9.41E-04	9.41E-04	2.76E-04	#VALUE!	2.91E+02	#VALUE!	1.05E+03	1.1E+03	J	
Dichlorobenzene,1,3-	8.74E-04	8.74E-04	1.04E-04	#VALUE!	4.60E+00	#VALUE!	4.44E+01	4.4E+01	J	
Dichlorobenzene,1,4-	9.40E-04	9.40E-04	2.22E-04		1.43E+03		6.45E+03	6.5E+03	K	
Dichlorobenzidine,3,3-										
Dichloroethane,1,1-	1.01E-03	1.01E-03	4.54E-03	#VALUE!	7.31E+02	#VALUE!	1.61E+02	1.6E+02	J	
Dichloroethane,1,2-	1.42E-03	1.42E-03	1.46E-03	3.85E+00		2.64E+00		2.6E+00	K	
Dichloroethene,1,1-	1.22E-03	1.22E-03	1.95E-02	#VALUE!	2.91E+02		1.49E+01	1.5E+01	J	
Dichloroethene,cis,1,2-	1.00E-03	1.00E-03	4.32E-03	#VALUE!	5.11E+01	#VALUE!	1.18E+01	1.2E+01	J	
Dichloroethene,trans,1,2-	9.61E-04	9.61E-04	8.69E-03	#VALUE!	1.02E+02	#VALUE!	1.18E+01	1.2E+01	J	
Dichlorophenol,2,4-										
Dichloropropane,1,2-	1.06E-03	1.06E-03	2.66E-03		8.26E+03		3.10E+03	3.1E+03	K	
Dichloropropene,1,3-	8.56E-04	8.56E-04	1.39E-03		1.07E+02		7.69E+01	7.7E+01	K	
Dieldrin										
Diethylphthalate										
Dimethylphenol,2,4-										

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SOILesi
(mg/kg)

Subsurface soil located beneath enclosed structure-Industrial					Derivation of Management Option 2 RS				
Revision Date: 08/04/2003					Run date:	10/17/2003			
INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL						Site-Specific			
volumetric air content in foundation/wall cracks					nacrack =	0.14849057	cm3-air/cm3-total vol		
volumetric water content in foundation/wall cracks					nwcrack =	0.21	cm3-water/cm3-total vol		
total porosity of foundation/wall cracks					nf =	0.35849057	cm3/cm3		
bgs depth to contaminated subsurface soils					Ls =	100	cm		
enclosed-structure air exahnge rate					ER =	0.00023	1/s		
enclosed-structure volume/infiltration area ratio					Lb =	300	cm		
enclosed-structure foundation or wall thickness					Lcrack =	15	cm		
areal fraction of cracks in foundation/walls					FC =	0.01	cm2-cracks/cm2-total area		
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2									
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2									
VFsoilesi = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000									
Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)									
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)									
Soilesi = Cai*0.001/VFsoilesi									
	Ds	Dcrack	VFsoilesi	Cai	Cai	Soilesi	Soilesi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(mg/m3/mg/kg	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/kg)	N-O(mg/kg)	(C or N)	
Dimethylphthalate									
Di-n-octylphthalate									
Dinitrobenzene,1,3-									
Dinitrophenol,2,4-									
Dinitrotoluene,2,6-									
Dinitrotoluene,2,4-									
Dinoseb									
Endosulfan									
Endrin									
Ethyl benzene	1.02E-03	1.02E-03	2.17E-03		1.03E+04		4.75E+03	4.8E+03	K
Fluoranthene									
Fluorene	6.23E-04	6.23E-04	3.17E-07	#VALUE!	2.04E+02	#VALUE!	6.44E+05	6.4E+05	J
Heptachlor									
Heptachlor epoxide									
Hexachlorobenzene	7.41E-04	7.41E-04	7.56E-07	2.00E-01		2.65E+02		2.6E+02	K
Hexachlorobutadiene									
Hexachlorocyclohexane,alpha									
Hexachlorocyclohexane,beta									
Hexachlorocyclohexane,gamma									
Hexachlorocyclopentadiene	2.19E-04	2.19E-04	1.83E-06	#VALUE!	2.91E-01	#VALUE!	1.59E+02	1.6E+02	J
Hexachloroethane	3.58E-05	3.58E-05	4.78E-06	2.50E+01		5.23E+03		5.2E+03	K
Indeno(1,2,3-cd)pyrene									
Isobutyl alcohol									
Isophorone									
Lead (inorganic)									
Mercury (inorganic)									
Methoxychlor									
Methylene chloride	1.38E-03	1.38E-03	6.65E-03	2.13E+02		3.20E+01		3.2E+01	K
Methyl ethyl ketone	1.28E-03	1.28E-03	2.03E-04		1.40E+04		6.89E+04	6.9E+04	K
Methyl isobutyl ketone	1.08E-03	1.08E-03	3.47E-04		4.88E+03		1.41E+04	1.4E+04	K
Methylnaphthalene,2-	7.94E-04	7.94E-04	1.26E-06	#VALUE!	4.39E+00	#VALUE!	3.49E+03	3.5E+03	J

LDEQ RECAP
WORKSHEET 12
SOILesi
(mg/kg)

Subsurface soil located beneath enclosed structure-Industrial	Derivation of Management Option 2 RS		
Revision Date: 08/04/2003	Run date:	10/17/2003	
INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
bgs depth to contaminated subsurface soils	Ls =	100	cm
enclosed-structure air exahnge rate	ER =	0.00023	1/s
enclosed-structure volume/infiltration area ratio	Lb =	300	cm
enclosed-structure foundation or wall thickness	Lcrack =	15	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2
VFsoilesi = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

Soilesi = Cai*0.001/VFsoilesi

	Ds	Dcrack	VFsoilesi	Cai	Cai	Soilesi	Soilesi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(mg/m3/mg/kg	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/kg)	N-O(mg/kg)	(C or N)	
MTBE (methyl tert-butyl ether)	1.40E-03	1.40E-03	1.59E-03	#VALUE!	4.38E+03	#VALUE!	2.76E+03	2.8E+03	J
Naphthalene	8.17E-04	8.17E-04	2.02E-05	#VALUE!	4.39E+00	#VALUE!	2.18E+02	2.2E+02	J
Nickel									
Nitrate									
Nitrite									
Nitroaniline,2-	9.76E-04	9.76E-04	1.56E-04	#VALUE!	1.48E-01	#VALUE!	9.50E-01	9.5E-01	J
Nitroaniline,3-	5.38E-02	5.38E-02	1.26E-05	#VALUE!	1.53E+01	#VALUE!	1.22E+03	1.2E+03	J
Nitroaniline,4-									
Nitrobenzene	1.41E-03	1.41E-03	1.50E-05		1.19E+02		7.94E+03	7.9E+03	K
Nitrophenol,4-									
Nitrosodi-n-propylamine,n-									
N-nitrosodiphenylamine									
Pentachlorophenol									
Phenanthrene	7.89E-04	7.89E-04	2.36E-07	#VALUE!	1.53E+03	#VALUE!	6.50E+06	6.5E+06	J
Phenol	2.52E-02	2.52E-02	1.25E-05	#VALUE!	1.53E+03	#VALUE!	1.22E+05	1.2E+05	J
Polychlorinated biphenyls									
Pyrene	1.06E-03	1.06E-03	1.06E-08	#VALUE!	1.53E+02	#VALUE!	1.44E+07	1.4E+07	J
Selenium									
Silver									
Styrene	9.67E-04	9.67E-04	1.76E-04		1.00E+03		5.68E+03	5.7E+03	K
Tetrachlorobenzene,1,2,4,5-									
Tetrachloroethane,1,1,1,2-	8.18E-04	8.18E-04	1.60E-03	1.00E-01		6.26E-02		6.3E-02	K
Tetrachloroethane,1,1,2,2-	9.88E-04	9.88E-04	2.11E-04	1.70E+00		8.04E+00		8.0E+00	K
Tetrachloroethylene	9.78E-04	9.78E-04	3.76E-03	1.10E+02		2.93E+01		2.9E+01	K
Tetrachlorophenol,2,3,4,6-									
Thallium									
Toluene	1.18E-03	1.18E-03	2.95E-03		4.00E+02		1.35E+02	1.4E+02	K
Toxaphene									
Trichlorobenzene,1,2,4-	4.13E-04	4.13E-04	2.16E-05	#VALUE!	2.91E+02	#VALUE!	1.35E+04	1.3E+04	J
Trichloroethane,1,1,1-	1.06E-03	1.06E-03	6.80E-03	#VALUE!	1.46E+03	#VALUE!	2.15E+02	2.1E+02	J
Trichloroethane,1,1,2-	1.07E-03	1.07E-03	6.28E-04	6.30E+00		1.00E+01		1.0E+01	K

LDEQ RECAP
WORKSHEET 12
SOILesi
(mg/kg)

Subsurface soil located beneath enclosed structure-Industrial — Derivation of Management Option 2 RS

Revision Date: 08/04/2003 — Run date: 10/17/2003

INPUTS TO SUBSURFACE SOIL BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
bgs depth to contaminated subsurface soils	Ls =	100	cm
enclosed-structure air exahnge rate	ER =	0.00023	1/s
enclosed-structure volume/infiltration area ratio	Lb =	300	cm
enclosed-structure foundation or wall thickness	Lcrack =	15	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2

VFsoilesi = [(H*41*pb/(nw+Koc*foc*pb+H*41*na))*(Ds/Ls)/(ER*Lb)]/[1+(Ds/Ls)/(ER*Lb)+(Ds/Ls)/((Dcrack/Lcrack)*FC)]*1000

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)

Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

Soilesi = Cai*0.001/VFsoilesi

	Ds	Dcrack	VFsoilesi	Cai	Cai	Soilesi	Soilesi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(mg/m3/mg/kg	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/kg)	N-O(mg/kg)	(C or N)	
Trichloroethene	1.07E-03	1.07E-03	5.65E-03	5.90E+01		1.04E+01		1.0E+01	K
Trichlorofluoromethane	1.18E-03	1.18E-03	2.99E-02	#VALUE!	1.02E+03	#VALUE!	3.42E+01	3.4E+01	J
Trichlorophenol,2,4,5-									
Trichlorophenol,2,4,6-									
Vanadium									
Vinyl chloride	1.44E-03	1.44E-03	4.35E-02	1.20E+00		2.76E-02		2.8E-02	K
Xylene(mixed)	9.51E-04	9.51E-04	2.90E-03	#VALUE!	1.48E+02	#VALUE!	5.10E+01	5.1E+01	J
Zinc									
Aliphatics C6-C8	1.36E-03	1.36E-03	2.17E-02		1.93E+04		8.92E+02	8.9E+02	J
Aliphatics >C8-C10	1.36E-03	1.36E-03	4.99E-03		1.06E+03		2.12E+02	2.1E+02	J
Aliphatics >C10-C12	1.36E-03	1.36E-03	9.73E-04		1.10E+03		1.12E+03	1.1E+03	J
Aliphatics >C12-C16	1.36E-03	1.36E-03	2.13E-04		1.10E+03		5.15E+03	5.2E+03	J
Aliphatics >C16-C35									
Aromatics >C8-C10	1.36E-03	1.36E-03	6.10E-04		2.19E+02		3.59E+02	3.6E+02	J
Aromatics >C10-C12	1.36E-03	1.36E-03	1.13E-04		2.19E+02		1.93E+03	1.9E+03	J
Aromatics >C12-C16	1.37E-03	1.37E-03	2.17E-05		2.19E+02		1.01E+04	1.0E+04	J
Aromatics >C16-C21									
Aromatics >C21-C35									
TPH-GRO (C6-C10)					2.19E+02			2.1E+02	
TPH-DRO (C10-C28)									
TPH-ORO (>C28)									

J - Risk-based value calculated with one of the equations EQ 56 thru 59.

K - Louisiana Toxic Air Pollutant Ambient Air Standards (LAC 33:III.5112 Table 51.2).

Groundwater located beneath enclosed structure-Non-industrial	Derivation of Management Option 2 RS		
Revision Date: 08/04/2003	Run date:	10/17/2003	
INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
enclosed-structure air exchange rate	ER =	0.00014	1/s
enclosed-structure volume/infiltration area ratio	Lb =	200	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area
enclosed-structure foundation or wall thickness	Lcrack =	15	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)
VFgwesni = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)
Cani N-O= (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

GWesni = Cani*0.001/VFgwesni

COMPOUND	Ds (cm2/s)	Dcrack (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwesni (mg/m3/mg/l)	Cani C-O (ug/m3)	Cani N-O (ug/m3)	GWesni C-O(mg/l)	GWesni N-O(mg/l)	min value (C or N)	Note
Acenaphthene	6.24E-04	6.24E-04	2.70E-04	6.10E-04	7.84E-05	#VALUE!	2.19E+02	#VALUE!	2.79E+03	2.8E+03	J
Acenaphthylene	6.65E-04	6.65E-04	3.60E-04	6.56E-04	6.16E-05	#VALUE!	2.19E+02	#VALUE!	3.56E+03	3.6E+03	J
Acetone	1.99E-03	1.99E-03	1.60E-03	1.98E-03	6.28E-05	#VALUE!	3.65E+02	#VALUE!	5.81E+03	5.8E+03	J
Aldrin											
Aniline											
Anthracene	5.65E-04	5.65E-04	6.48E-04	5.66E-04	2.99E-05	#VALUE!	1.10E+03	#VALUE!	3.66E+04	3.7E+04	J
Antimony											
Arsenic											
Barium											
Benzene	1.20E-03	1.20E-03	1.02E-05	4.07E-04	4.08E-03	1.20E+01		2.94E+00		2.9E+00	K
Benz(a)anthracene											
Benzo(a)pyrene											
Benzo(b)fluoranthene											
Benzo(k)fluoranthene											
Beryllium											
Biphenyl,1,1-	5.77E-04	5.77E-04	1.48E-04	5.50E-04	1.40E-04		2.38E+01		1.70E+02	1.7E+02	K
Bis(2-chloroethyl)ether	1.38E-03	1.38E-03	2.28E-03	1.39E-03	2.02E-05	3.00E-01		1.48E+01		1.5E+01	K
Bis(2-chloroisopropyl)ether	8.69E-04	8.69E-04	3.19E-04	8.45E-04	7.95E-05	1.90E-01	1.46E+02	2.38E+00	1.84E+03	2.4E+00	J
Bis(2-ethyl-hexyl)phthalate											
Bromodichloromethane	4.12E-04	4.12E-04	3.62E-05	3.51E-04	5.21E-04	1.07E-01	7.30E+01	2.06E-01	1.40E+02	2.1E-01	J
Bromoform	2.23E-04	2.23E-04	1.05E-04	2.18E-04	9.65E-05	1.72E+00	7.30E+01	1.79E+01	7.56E+02	1.8E+01	J
Bromomethane	9.90E-04	9.90E-04	1.11E-05	4.01E-04	4.01E-03	#VALUE!	5.22E+00	#VALUE!	1.30E+00	1.3E+00	J
Butyl benzyl phthalate											
Cadmium											
Carbon Disulfide	1.41E-03	1.41E-03	2.47E-06	1.34E-04	1.35E-02		7.14E+01		5.30E+00	5.3E+00	K
Carbon Tetrachloride	1.06E-03	1.06E-03	2.08E-06	1.12E-04	1.09E-02	6.67E+00		6.14E-01		6.1E-01	K
Chlordane											
Chloroaniline,p-											
Chlorobenzene	9.94E-04	9.94E-04	1.33E-05	4.45E-04	2.48E-03		1.10E+03		4.43E+02	4.4E+02	K
Chlorodibromomethane	2.80E-04	2.80E-04	7.31E-05	2.68E-04	1.77E-04	7.90E-02	7.30E+01	4.46E-01	4.12E+02	4.5E-01	J
Chloroethane (Ethylchloride)	3.68E-03	3.68E-03	8.87E-06	4.66E-04	1.23E-02		6.29E+04		5.13E+03	5.1E+03	K
Chloroform	1.41E-03	1.41E-03	1.55E-05	5.65E-04	3.38E-03	4.30E+00		1.27E+00		1.3E+00	K
Chloromethane	1.71E-03	1.71E-03	4.84E-06	2.49E-04	6.19E-03	5.56E+01		8.98E+00		9.0E+00	K
Chloronaphthalene,2-	5.01E-04	5.01E-04	1.55E-04	4.83E-04	1.26E-04	#VALUE!	2.92E+02	#VALUE!	2.33E+03	2.3E+03	J
Chlorophenol,2-	7.06E-04	7.06E-04	1.32E-04	6.58E-04	2.22E-04	#VALUE!	1.83E+01	#VALUE!	8.23E+01	8.2E+01	J
Chromium(III)											

LDEQ RECAP
WORKSHEET 13
GWesni
(mg/l)

Groundwater located beneath enclosed structure-Non-industrial	Derivation of Management Option 2 RS		
Revision Date: 08/04/2003	Run date:	10/17/2003	
INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
enclosed-structure air exchange rate	ER =	0.00014	1/s
enclosed-structure volume/infiltration area ratio	Lb =	200	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area
enclosed-structure foundation or wall thickness	Lcrack =	15	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)
VFgwesni = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)
Cani N-O= (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

GWesni = Cani*0.001/VFgwesni

COMPOUND	Ds (cm2/s)	Dcrack (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwesni (mg/m3/mg/l)	Cani C-O (ug/m3)	Cani N-O (ug/m3)	GWesni C-O(mg/l)	GWesni N-O(mg/l)	min value (C or N)	Note
Chromium(VI)											
Chrysene											
Cobalt											
Copper											
Cyanide (free)											
DDD											
DDE											
DDT											
Dibenz(a,h)anthracene											
Dibenzofuran	8.47E-04	8.47E-04	2.51E-03	8.57E-04	8.98E-06	#VALUE!	1.46E+01	#VALUE!	1.63E+03	1.6E+03	J
Dibromo-3-chloropropane,1,2-											
Dichlorobenzene,1,2-	9.41E-04	9.41E-04	2.31E-05	5.66E-04	1.31E-03	#VALUE!	2.08E+02	#VALUE!	1.59E+02	1.6E+02	J
Dichlorobenzene,1,3-	8.74E-04	8.74E-04	1.21E-05	4.00E-04	1.96E-03	#VALUE!	3.29E+00	#VALUE!	1.68E+00	1.7E+00	J
Dichlorobenzene,1,4-	9.40E-04	9.40E-04	1.81E-05	5.09E-04	1.63E-03		1.43E+03		8.78E+02	8.8E+02	K
Dichlorobenzidine,3,3-											
Dichloroethane,1,1-	1.01E-03	1.01E-03	1.06E-05	3.94E-04	3.66E-03	#VALUE!	5.22E+02	#VALUE!	1.43E+02	1.4E+02	J
Dichloroethane,1,2-	1.42E-03	1.42E-03	5.57E-05	1.01E-03	1.06E-03	3.85E+00		3.63E+00		3.6E+00	K
Dichloroethene,1,1-	1.22E-03	1.22E-03	2.75E-06	1.46E-04	1.16E-02	#VALUE!	2.08E+02	#VALUE!	1.79E+01	1.8E+01	J
Dichloroethene,cis,1,2-	1.00E-03	1.00E-03	1.55E-05	4.87E-04	2.83E-03	#VALUE!	3.65E+01	#VALUE!	1.29E+01	1.3E+01	J
Dichloroethene,trans,1,2-	9.61E-04	9.61E-04	7.36E-06	3.04E-04	5.39E-03	#VALUE!	7.30E+01	#VALUE!	1.35E+01	1.4E+01	J
Dichlorophenol,2,4-											
Dichloropropane,1,2-	1.06E-03	1.06E-03	1.75E-05	5.33E-04	2.08E-03		8.26E+03		3.97E+03	4.0E+03	K
Dichloropropene,1,3-	8.56E-04	8.56E-04	3.11E-05	5.94E-04	1.15E-03		1.07E+02		9.32E+01	9.3E+01	K
Dieldrin											
Diethylphthalate											
Dimethylphenol,2,4-											
Dimethylphthalate											
Di-n-octylphthalate											
Dinitrobenzene,1,3-											
Dinitrophenol,2,4-											
Dinitrotoluene,2,6-											
Dinitrotoluene,2,4-											
Dinoseb											
Endosulfan											
Endrin											
Ethyl benzene	1.02E-03	1.02E-03	5.87E-06	2.63E-04	4.42E-03		1.03E+04		2.33E+03	2.3E+03	K

LDEQ RECAP
WORKSHEET 13
GWesni
(mg/l)

Groundwater located beneath enclosed structure-Non-industrial					Derivation of Management Option 2 RS						
Revision Date: 08/04/2003					Run date:	10/17/2003					
INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL						Site-Specific					
volumetric air content in foundation/wall cracks					nacrack =	0.14849057	cm3-air/cm3-total vol				
volumetric water content in foundation/wall cracks					nwcrack =	0.21	cm3-water/cm3-total vol				
total porosity of foundation/wall cracks					nf =	0.35849057	cm3/cm3				
volumetric air content in capillary fringe					nacap =	0.015	cm3-air/cm3-soil				
volumetric water content in capillary fringe					nwcap =	0.345	cm3-water/cm3-soil				
total porosity of capillary fringe soil					nc =	0.36	cm3/cm3				
thickness of capillary fringe					hcap =	5	cm				
thickness of vadose zone					hv =	295	cm				
depth to groundwater					Lgw =	300	cm				
enclosed-structure air exchange rate					ER =	0.00014	1/s				
enclosed-structure volume/infiltration area ratio					Lb =	200	cm				
areal fraction of cracks in foundation/walls					FC =	0.01	cm2-cracks/cm2-total area				
enclosed-structure foundation or wall thickness					Lcrack =	15	cm				
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2											
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2											
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2											
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)											
VFgwesni = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000											
Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)											
Cani N-O= (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)											
GWesni = Cani*0.001/VFgwesni											
	Ds	Dcrack	Dcap	Dws	VFgwesni	Cani	Cani	GWesni	GWesni	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(cm2/s)	(cm2/s)	(mg/m3/mg/l)	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/l)	N-O(mg/l)	(C or N)	
Fluoranthene											
Fluorene	6.23E-04	6.23E-04	6.74E-04	6.24E-04	3.22E-05	#VALUE!	1.46E+02	#VALUE!	4.53E+03	4.5E+03	J
Heptachlor											
Heptachlor epoxide											
Hexachlorobenzene	7.41E-04	7.41E-04	2.47E-05	4.99E-04	7.36E-04	2.00E-01		2.72E-01		2.7E-01	K
Hexachlorobutadiene											
Hexachlorocyclohexane,alpha											
Hexachlorocyclohexane,beta											
Hexachlorocyclohexane,gamma											
Hexachlorocyclopentadiene	2.19E-04	2.19E-04	1.56E-06	6.58E-05	3.46E-03	#VALUE!	2.08E-01	#VALUE!	6.01E-02	6.0E-02	J
Hexachloroethane	3.58E-05	3.58E-05	9.52E-06	3.42E-05	1.12E-04	2.50E+01		2.23E+02		2.2E+02	K
Indeno(1,2,3-cd)pyrene											
Isobutyl alcohol											
Isophorone											
Lead (inorganic)											
Mercury (inorganic)											
Methoxychlor											
Methylene chloride	1.38E-03	1.38E-03	2.97E-05	7.84E-04	2.18E-03	2.13E+02		9.77E+01		9.8E+01	K
Methyl ethyl ketone	1.28E-03	1.28E-03	9.52E-04	1.27E-03	5.83E-05		1.40E+04		2.40E+05	2.4E+05	K
Methyl isobutyl ketone	1.08E-03	1.08E-03	3.04E-04	1.03E-03	1.22E-04		4.88E+03		4.01E+04	4.0E+04	K
Methylnaphthalene,2-	7.94E-04	7.94E-04	7.36E-04	7.93E-04	3.74E-05	#VALUE!	3.14E+00	#VALUE!	8.38E+01	8.4E+01	J
MTBE (methyl tert-butyl ether)	1.40E-03	1.40E-03	9.80E-05	1.15E-03	6.46E-04	#VALUE!	3.13E+03	#VALUE!	4.84E+03	4.8E+03	J
Naphthalene	8.17E-04	8.17E-04	8.48E-05	7.15E-04	3.14E-04	#VALUE!	3.14E+00	#VALUE!	1.00E+01	1.0E+01	J
Nickel											
Nitrate											
Nitrite											
Nitroaniline,2-	9.76E-04	9.76E-04	4.15E-04	9.54E-04	7.69E-05	#VALUE!	1.06E-01	#VALUE!	1.38E+00	1.4E+00	J
Nitroaniline,3-	5.38E-02	5.38E-02	2.74E-01	5.45E-02	6.44E-06	#VALUE!	1.10E+01	#VALUE!	1.70E+03	1.7E+03	J
Nitroaniline,4-											
Nitrobenzene	1.41E-03	1.41E-03	1.95E-03	1.41E-03	2.75E-05		1.19E+02		4.33E+03	4.3E+03	K
Nitrophenol,4-											
Nitrosodi-n-propylamine,n-											
N-nitrosodiphenylamine											
Pentachlorophenol											
Phenanthrene	7.89E-04	7.89E-04	1.81E-03	7.96E-04	1.50E-05	#VALUE!	1.10E+03	#VALUE!	7.31E+04	7.3E+04	J
Phenol	2.52E-02	2.52E-02	1.25E-01	2.55E-02	8.15E-06	#VALUE!	1.10E+03	#VALUE!	1.34E+05	1.3E+05	J

LDEQ RECAP
WORKSHEET 13
GWesni
(mg/l)

Groundwater located beneath enclosed structure-Non-industrial — Derivation of Management Option 2 RS

Revision Date: 08/04/2003 — Run date: 10/17/2003

INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
enclosed-structure air exchange rate	ER =	0.00014	1/s
enclosed-structure volume/infiltration area ratio	Lb =	200	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area
enclosed-structure foundation or wall thickness	Lcrack =	15	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2

Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2

Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)

VFgwesni = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)

Cani N-O= (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

GWesni = Cani*0.001/VFgwesni

COMPOUND	Ds (cm2/s)	Dcrack (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwesni (mg/m3/mg/l)	Cani C-O (ug/m3)	Cani N-O (ug/m3)	GWesni C-O(mg/l)	GWesni N-O(mg/l)	min value (C or N)	Note
Polychlorinated biphenyls											
Pyrene	1.06E-03	1.06E-03	3.58E-03	1.07E-03	9.51E-06	#VALUE!	1.10E+02	#VALUE!	1.15E+04	1.2E+04	J
Selenium											
Silver											
Styrene	9.67E-04	9.67E-04	1.63E-05	4.90E-04	1.86E-03		1.00E+03		5.37E+02	5.4E+02	K
Tetrachlorobenzene,1,2,4,5-											
Tetrachloroethane,1,1,1,2-	8.18E-04	8.18E-04	1.56E-05	4.40E-04	1.40E-03	1.00E-01		7.16E-02		7.2E-02	K
Tetrachloroethane,1,1,2,2-	9.88E-04	9.88E-04	1.25E-04	8.86E-04	2.72E-04	1.70E+00		6.25E+00		6.2E+00	K
Tetrachloroethylene	9.78E-04	9.78E-04	2.89E-06	1.48E-04	7.56E-03	1.10E+02		1.45E+01		1.5E+01	K
Tetrachlorophenol,2,3,4,6-											
Thallium											
Toluene	1.18E-03	1.18E-03	7.61E-06	3.31E-04	4.47E-03		4.00E+02		8.95E+01	8.9E+01	K
Toxaphene											
Trichlorobenzene,1,2,4-	4.13E-04	4.13E-04	3.17E-05	3.44E-04	4.62E-04	#VALUE!	2.08E+02	#VALUE!	4.50E+02	4.5E+02	J
Trichloroethane,1,1,1-	1.06E-03	1.06E-03	3.29E-06	1.67E-04	7.84E-03	#VALUE!	1.04E+03	#VALUE!	1.33E+02	1.3E+02	J
Trichloroethane,1,1,2-	1.07E-03	1.07E-03	5.29E-05	8.10E-04	7.54E-04	6.30E+00		8.36E+00		8.4E+00	K
Trichloroethene	1.07E-03	1.07E-03	5.32E-06	2.47E-04	5.77E-03	5.90E+01		1.02E+01		1.0E+01	K
Trichlorofluoromethane	1.18E-03	1.18E-03	1.11E-06	6.31E-05	2.36E-02	#VALUE!	7.30E+02	#VALUE!	3.09E+01	3.1E+01	J
Trichlorophenol,2,4,5-											
Trichlorophenol,2,4,6-											
Vanadium											
Vinyl chloride	1.44E-03	1.44E-03	9.38E-07	5.42E-05	6.01E-03	1.20E+00		2.00E-01		2.0E-01	K
Xylene(mixed)	9.51E-04	9.51E-04	6.04E-06	2.64E-04	4.10E-03	#VALUE!	1.06E+02	#VALUE!	2.58E+01	2.6E+01	J
Zinc											
Aliphatics C6-C8	1.36E-03	1.36E-03	6.96E-07	4.05E-05	2.10E-01		1.93E+04		9.21E+01	9.2E+01	J
Aliphatics >C8-C10	1.36E-03	1.36E-03	6.79E-07	3.96E-05	3.29E-01		1.06E+03		3.22E+00	3.2E+00	J
Aliphatics >C10-C12	1.36E-03	1.36E-03	6.70E-07	3.91E-05	4.88E-01		1.10E+03		2.24E+00	2.2E+00	J
Aliphatics >C12-C16	1.36E-03	1.36E-03	6.56E-07	3.82E-05	2.08E+00		1.10E+03		5.27E-01	5.3E-01	J
Aliphatics >C16-C35											
Aromatics >C8-C10	1.36E-03	1.36E-03	5.30E-06	2.59E-04	7.57E-03		2.19E+02		2.89E+01	2.9E+01	J
Aromatics >C10-C12	1.36E-03	1.36E-03	1.66E-05	5.79E-04	3.08E-03		2.19E+02		7.11E+01	7.1E+01	J
Aromatics >C12-C16	1.37E-03	1.37E-03	4.28E-05	9.02E-04	1.32E-03		2.19E+02		1.66E+02	1.7E+02	J
Aromatics >C16-C21											
Aromatics >C21-C35											

LDEQ RECAP
WORKSHEET 13
GWesni
(mg/l)

Groundwater located beneath enclosed structure-Non-industrial					Derivation of Management Option 2 RS						
Revision Date: 08/04/2003					Run date:	10/17/2003					
INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-NONINDUSTRIAL						Site-Specific					
volumetric air content in foundation/wall cracks					nacrack =	0.14849057	cm3-air/cm3-total vol				
volumetric water content in foundation/wall cracks					nwcrack =	0.21	cm3-water/cm3-total vol				
total porosity of foundation/wall cracks					nf =	0.35849057	cm3/cm3				
volumetric air content in capillary fringe					nacap =	0.015	cm3-air/cm3-soil				
volumetric water content in capillary fringe					nwcap =	0.345	cm3-water/cm3-soil				
total porosity of capillary fringe soil					nc =	0.36	cm3/cm3				
thickness of capillary fringe					hcap =	5	cm				
thickness of vadose zone					hv =	295	cm				
depth to groundwater					Lgw =	300	cm				
enclosed-structure air exchange rate					ER =	0.00014	1/s				
enclosed-structure volume/infiltration area ratio					Lb =	200	cm				
areal fraction of cracks in foundation/walls					FC =	0.01	cm2-cracks/cm2-total area				
enclosed-structure foundation or wall thickness					Lcrack =	15	cm				
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2											
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2											
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2											
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)											
VFgwesni = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000											
Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)											
Cani N-O= (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)											
GWesni = Cani*0.001/VFgwesni											
	Ds	Dcrack	Dcap	Dws	VFgwesni	Cani	Cani	GWesni	GWesni	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(cm2/s)	(cm2/s)	(mg/m3/mg/l)	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/l)	N-O(mg/l)	(C or N)	
TPH-GRO (C6-C10)							2.19E+02			3.2E+00	
TPH-DRO (C10-C28)											
TPH-ORO (>C28)											
J - Risk-based value calculated with one of the equations EQ 56 thru 59.											
K - Louisiana Toxic Air Pollutant Ambient Air Standards (LAC 33:III.5112 Table 51.2).											

Groundwater located beneath enclosed structure-Industrial	Derivation of Management Option 2 RS		
Revision Date: 08/04/2003	Run date:	10/17/2003	
INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
enclosed-structure air exchange rate	ER =	0.00023	1/s
enclosed-structure volume/infiltration area ratio	Lb =	300	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area
enclosed-structure foundation or wall thickness	Lcrack =	15	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2

Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2

Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)

VFgwesi = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)

Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

GWesi = Cai*0.001/VFgwesi

COMPOUND	Ds (cm2/s)	Dcrack (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwesi (mg/m3/mg/l)	Cai C-O (ug/m3)	Cai N-O (ug/m3)	GWesi C-O(mg/l)	GWesi N-O(mg/l)	min value (C or N)	Note
Acenaphthene	6.24E-04	6.24E-04	2.70E-04	6.10E-04	3.18E-05	#VALUE!	3.07E+02	#VALUE!	9.64E+03	9.6E+03	J
Acenaphthylene	6.65E-04	6.65E-04	3.60E-04	6.56E-04	2.50E-05	#VALUE!	3.07E+02	#VALUE!	1.23E+04	1.2E+04	J
Acetone	1.99E-03	1.99E-03	1.60E-03	1.98E-03	2.55E-05	#VALUE!	5.11E+02	#VALUE!	2.00E+04	2.0E+04	J
Aldrin											
Aniline											
Anthracene	5.65E-04	5.65E-04	6.48E-04	5.66E-04	1.21E-05	#VALUE!	1.53E+03	#VALUE!	1.26E+05	1.3E+05	J
Antimony											
Arsenic											
Barium											
Benzene	1.20E-03	1.20E-03	1.02E-05	4.07E-04	1.66E-03	1.20E+01		7.25E+00		7.2E+00	K
Benz(a)anthracene											
Benzo(a)pyrene											
Benzo(b)fluoranthene											
Benzo(k)fluoranthene											
Beryllium											
Biphenyl,1,1-	5.77E-04	5.77E-04	1.48E-04	5.50E-04	5.67E-05		2.38E+01		4.20E+02	4.2E+02	K
Bis(2-chloroethyl)ether	1.38E-03	1.38E-03	2.28E-03	1.39E-03	8.20E-06	3.00E-01		3.66E+01		3.7E+01	K
Bis(2-chloroisopropyl)ether	8.69E-04	8.69E-04	3.19E-04	8.45E-04	3.23E-05	4.09E-01	2.04E+02	1.27E+01	6.33E+03	1.3E+01	J
Bis(2-ethyl-hexyl)phthalate											
Bromodichloromethane	4.12E-04	4.12E-04	3.62E-05	3.51E-04	2.11E-04	2.31E-01	1.02E+02	1.09E+00	4.84E+02	1.1E+00	J
Bromoform	2.23E-04	2.23E-04	1.05E-04	2.18E-04	3.92E-05	3.72E+00	1.02E+02	9.49E+01	2.61E+03	9.5E+01	J
Bromomethane	9.90E-04	9.90E-04	1.11E-05	4.01E-04	1.63E-03	#VALUE!	7.31E+00	#VALUE!	4.49E+00	4.5E+00	J
Butyl benzyl phthalate											
Cadmium											
Carbon Disulfide	1.41E-03	1.41E-03	2.47E-06	1.34E-04	5.47E-03		7.14E+01		1.31E+01	1.3E+01	K
Carbon Tetrachloride	1.06E-03	1.06E-03	2.08E-06	1.12E-04	4.41E-03	6.67E+00		1.51E+00		1.5E+00	K
Chlordane											
Chloroaniline,p-											
Chlorobenzene	9.94E-04	9.94E-04	1.33E-05	4.45E-04	1.01E-03		1.10E+03		1.09E+03	1.1E+03	K
Chlorodibromomethane	2.80E-04	2.80E-04	7.31E-05	2.68E-04	7.19E-05	1.70E-01	1.02E+02	2.37E+00	1.42E+03	2.4E+00	J
Chloroethane (Ethylchloride)	3.68E-03	3.68E-03	8.87E-06	4.66E-04	4.97E-03		6.29E+04		1.26E+04	1.3E+04	K
Chloroform	1.41E-03	1.41E-03	1.55E-05	5.65E-04	1.37E-03	4.30E+00		3.14E+00		3.1E+00	K
Chloromethane	1.71E-03	1.71E-03	4.84E-06	2.49E-04	2.51E-03	5.56E+01		2.21E+01		2.2E+01	K
Chloronaphthalene,2-	5.01E-04	5.01E-04	1.55E-04	4.83E-04	5.09E-05	#VALUE!	4.09E+02	#VALUE!	8.02E+03	8.0E+03	J
Chlorophenol,2-	7.06E-04	7.06E-04	1.32E-04	6.58E-04	9.00E-05	#VALUE!	2.56E+01	#VALUE!	2.84E+02	2.8E+02	J
Chromium(III)											

LDEQ RECAP
WORKSHEET 14
GWesi
(mg/l)

Groundwater located beneath enclosed structure-Industrial					Derivation of Management Option 2 RS						
Revision Date: 08/04/2003					Run date:	10/17/2003					
INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL						Site-Specific					
volumetric air content in foundation/wall cracks					nacrack =	0.14849057	cm3-air/cm3-total vol				
volumetric water content in foundation/wall cracks					nwcrack =	0.21	cm3-water/cm3-total vol				
total porosity of foundation/wall cracks					nf =	0.35849057	cm3/cm3				
volumetric air content in capillary fringe					nacap =	0.015	cm3-air/cm3-soil				
volumetric water content in capillary fringe					nwcap =	0.345	cm3-water/cm3-soil				
total porosity of capillary fringe soil					nc =	0.36	cm3/cm3				
thickness of capillary fringe					hcap =	5	cm				
thickness of vadose zone					hv =	295	cm				
depth to groundwater					Lgw =	300	cm				
enclosed-structure air exchange rate					ER =	0.00023	1/s				
enclosed-structure volume/infiltration area ratio					Lb =	300	cm				
areal fraction of cracks in foundation/walls					FC =	0.01	cm2-cracks/cm2-total area				
enclosed-structure foundation or wall thickness					Lcrack =	15	cm				
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2											
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2											
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2											
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)											
VFgwesi = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000											
Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)											
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)											
GWesi = Cai*0.001/VFgwesi											
	Ds	Dcrack	Dcap	Dws	VFgwesi	Cai	Cai	GWesi	GWesi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(cm2/s)	(cm2/s)	(mg/m3/mg/l)	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/l)	N-O(mg/l)	(C or N)	
Chromium(VI)											
Chrysene											
Cobalt											
Copper											
Cyanide (free)											
DDD											
DDE											
DDT											
Dibenz(a,h)anthracene											
Dibenzofuran	8.47E-04	8.47E-04	2.51E-03	8.57E-04	3.64E-06	#VALUE!	2.04E+01	#VALUE!	5.61E+03	5.6E+03	J
Dibromo-3-chloropropane,1,2-											
Dichlorobenzene,1,2-	9.41E-04	9.41E-04	2.31E-05	5.66E-04	5.32E-04	#VALUE!	2.91E+02	#VALUE!	5.48E+02	5.5E+02	J
Dichlorobenzene,1,3-	8.74E-04	8.74E-04	1.21E-05	4.00E-04	7.95E-04	#VALUE!	4.60E+00	#VALUE!	5.78E+00	5.8E+00	J
Dichlorobenzene,1,4-	9.40E-04	9.40E-04	1.81E-05	5.09E-04	6.61E-04		1.43E+03		2.16E+03	2.2E+03	K
Dichlorobenzidine,3,3-											
Dichloroethane,1,1-	1.01E-03	1.01E-03	1.06E-05	3.94E-04	1.49E-03	#VALUE!	7.31E+02	#VALUE!	4.92E+02	4.9E+02	J
Dichloroethane,1,2-	1.42E-03	1.42E-03	5.57E-05	1.01E-03	4.30E-04	3.85E+00		8.95E+00		8.9E+00	K
Dichloroethene,1,1-	1.22E-03	1.22E-03	2.75E-06	1.46E-04	4.72E-03	#VALUE!	2.91E+02	#VALUE!	6.17E+01	6.2E+01	J
Dichloroethene,cis,1,2-	1.00E-03	1.00E-03	1.55E-05	4.87E-04	1.15E-03	#VALUE!	5.11E+01	#VALUE!	4.45E+01	4.5E+01	J
Dichloroethene,trans,1,2-	9.61E-04	9.61E-04	7.36E-06	3.04E-04	2.19E-03	#VALUE!	1.02E+02	#VALUE!	4.67E+01	4.7E+01	J
Dichlorophenol,2,4-											
Dichloropropane,1,2-	1.06E-03	1.06E-03	1.75E-05	5.33E-04	8.44E-04		8.26E+03		9.79E+03	9.8E+03	K
Dichloropropene,1,3-	8.56E-04	8.56E-04	3.11E-05	5.94E-04	4.66E-04		1.07E+02		2.30E+02	2.3E+02	K
Dieldrin											
Diethylphthalate											
Dimethylphenol,2,4-											
Dimethylphthalate											
Di-n-octylphthalate											
Dinitrobenzene,1,3-											
Dinitrophenol,2,4-											
Dinitrotoluene,2,6-											
Dinitrotoluene,2,4-											
Dinoseb											
Endosulfan											
Endrin											
Ethyl benzene	1.02E-03	1.02E-03	5.87E-06	2.63E-04	1.79E-03		1.03E+04		5.75E+03	5.7E+03	K

LDEQ RECAP
WORKSHEET 14
GWesi
(mg/l)

Groundwater located beneath enclosed structure-Industrial — Derivation of Management Option 2 RS

Revision Date: 08/04/2003 — Run date: 10/17/2003

INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
enclosed-structure air exchange rate	ER =	0.00023	1/s
enclosed-structure volume/infiltration area ratio	Lb =	300	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area
enclosed-structure foundation or wall thickness	Lcrack =	15	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)
VFgwesi = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

GWesi = Cai*0.001/VFgwesi

	Ds	Dcrack	Dcap	Dws	VFgwesi	Cai	Cai	GWesi	GWesi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(cm2/s)	(cm2/s)	(mg/m3/mg/l)	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/l)	N-O(mg/l)	(C or N)	
Fluoranthene											
Fluorene	6.23E-04	6.23E-04	6.74E-04	6.24E-04	1.31E-05	#VALUE!	2.04E+02	#VALUE!	1.56E+04	1.6E+04	J
Heptachlor											
Heptachlor epoxide											
Hexachlorobenzene	7.41E-04	7.41E-04	2.47E-05	4.99E-04	2.99E-04	2.00E-01		6.70E-01		6.7E-01	K
Hexachlorobutadiene											
Hexachlorocyclohexane,alpha											
Hexachlorocyclohexane,beta											
Hexachlorocyclohexane,gamma											
Hexachlorocyclopentadiene	2.19E-04	2.19E-04	1.56E-06	6.58E-05	1.41E-03	#VALUE!	2.91E-01	#VALUE!	2.07E-01	2.1E-01	J
Hexachloroethane	3.58E-05	3.58E-05	9.52E-06	3.42E-05	4.56E-05	2.50E+01		5.48E+02		5.5E+02	K
Indeno(1,2,3-cd)pyrene											
Isobutyl alcohol											
Isophorone											
Lead (inorganic)											
Mercury (inorganic)											
Methoxychlor											
Methylene chloride	1.38E-03	1.38E-03	2.97E-05	7.84E-04	8.84E-04	2.13E+02		2.41E+02		2.4E+02	K
Methyl ethyl ketone	1.28E-03	1.28E-03	9.52E-04	1.27E-03	2.37E-05		1.40E+04		5.92E+05	5.9E+05	K
Methyl isobutyl ketone	1.08E-03	1.08E-03	3.04E-04	1.03E-03	4.94E-05		4.88E+03		9.88E+04	9.9E+04	K
Methylnaphthalene,2-	7.94E-04	7.94E-04	7.36E-04	7.93E-04	1.52E-05	#VALUE!	4.39E+00	#VALUE!	2.89E+02	2.9E+02	J
MTBE (methyl tert-butyl ether)	1.40E-03	1.40E-03	9.80E-05	1.15E-03	2.62E-04	#VALUE!	4.38E+03	#VALUE!	1.67E+04	1.7E+04	J
Naphthalene	8.17E-04	8.17E-04	8.48E-05	7.15E-04	1.27E-04	#VALUE!	4.39E+00	#VALUE!	3.45E+01	3.5E+01	J
Nickel											
Nitrate											
Nitrite											
Nitroaniline,2-	9.76E-04	9.76E-04	4.15E-04	9.54E-04	3.12E-05	#VALUE!	1.48E-01	#VALUE!	4.75E+00	4.7E+00	J
Nitroaniline,3-	5.38E-02	5.38E-02	2.74E-01	5.45E-02	2.61E-06	#VALUE!	1.53E+01	#VALUE!	5.87E+03	5.9E+03	J
Nitroaniline,4-											
Nitrobenzene	1.41E-03	1.41E-03	1.95E-03	1.41E-03	1.12E-05		1.19E+02		1.07E+04	1.1E+04	K
Nitrophenol,4-											
Nitrosodi-n-propylamine,n-											
N-nitrosodiphenylamine											
Pentachlorophenol											
Phenanthrene	7.89E-04	7.89E-04	1.81E-03	7.96E-04	6.08E-06	#VALUE!	1.53E+03	#VALUE!	2.52E+05	2.5E+05	J
Phenol	2.52E-02	2.52E-02	1.25E-01	2.55E-02	3.31E-06	#VALUE!	1.53E+03	#VALUE!	4.64E+05	4.6E+05	J

Groundwater located beneath enclosed structure-Industrial	Derivation of Management Option 2 RS		
Revision Date: 08/04/2003	Run date:	10/17/2003	
INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in foundation/wall cracks	nacrack =	0.14849057	cm3-air/cm3-total vol
volumetric water content in foundation/wall cracks	nwcrack =	0.21	cm3-water/cm3-total vol
total porosity of foundation/wall cracks	nf =	0.35849057	cm3/cm3
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
enclosed-structure air exchange rate	ER =	0.00023	1/s
enclosed-structure volume/infiltration area ratio	Lb =	300	cm
areal fraction of cracks in foundation/walls	FC =	0.01	cm2-cracks/cm2-total area
enclosed-structure foundation or wall thickness	Lcrack =	15	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2

Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2

Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)

VFgwesi = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)

Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

GWesi = Cai*0.001/VFgwesi

COMPOUND	Ds (cm2/s)	Dcrack (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwesi (mg/m3/mg/l)	Cai C-O (ug/m3)	Cai N-O (ug/m3)	GWesi C-O(mg/l)	GWesi N-O(mg/l)	min value (C or N)	Note
Polychlorinated biphenyls											
Pyrene	1.06E-03	1.06E-03	3.58E-03	1.07E-03	3.86E-06	#VALUE!	1.53E+02	#VALUE!	3.97E+04	4.0E+04	J
Selenium											
Silver											
Styrene	9.67E-04	9.67E-04	1.63E-05	4.90E-04	7.55E-04		1.00E+03		1.32E+03	1.3E+03	K
Tetrachlorobenzene,1,2,4,5-											
Tetrachloroethane,1,1,1,2-	8.18E-04	8.18E-04	1.56E-05	4.40E-04	5.67E-04	1.00E-01		1.76E-01		1.8E-01	K
Tetrachloroethane,1,1,2,2-	9.88E-04	9.88E-04	1.25E-04	8.86E-04	1.10E-04	1.70E+00		1.54E+01		1.5E+01	K
Tetrachloroethylene	9.78E-04	9.78E-04	2.89E-06	1.48E-04	3.07E-03	1.10E+02		3.59E+01		3.6E+01	K
Tetrachlorophenol,2,3,4,6-											
Thallium											
Toluene	1.18E-03	1.18E-03	7.61E-06	3.31E-04	1.81E-03		4.00E+02		2.20E+02	2.2E+02	K
Toxaphene											
Trichlorobenzene,1,2,4-	4.13E-04	4.13E-04	3.17E-05	3.44E-04	1.88E-04	#VALUE!	2.91E+02	#VALUE!	1.55E+03	1.6E+03	J
Trichloroethane,1,1,1-	1.06E-03	1.06E-03	3.29E-06	1.67E-04	3.18E-03	#VALUE!	1.46E+03	#VALUE!	4.60E+02	4.6E+02	J
Trichloroethane,1,1,2-	1.07E-03	1.07E-03	5.29E-05	8.10E-04	3.06E-04	6.30E+00		2.06E+01		2.1E+01	K
Trichloroethene	1.07E-03	1.07E-03	5.32E-06	2.47E-04	2.34E-03	5.90E+01		2.52E+01		2.5E+01	K
Trichlorofluoromethane	1.18E-03	1.18E-03	1.11E-06	6.31E-05	9.57E-03	#VALUE!	1.02E+03	#VALUE!	1.07E+02	1.1E+02	J
Trichlorophenol,2,4,5-											
Trichlorophenol,2,4,6-											
Vanadium											
Vinyl chloride	1.44E-03	1.44E-03	9.38E-07	5.42E-05	2.44E-03	1.20E+00		4.92E-01		4.9E-01	K
Xylene(mixed)	9.51E-04	9.51E-04	6.04E-06	2.64E-04	1.66E-03	#VALUE!	1.48E+02	#VALUE!	8.91E+01	8.9E+01	J
Zinc											
Aliphatics C6-C8	1.36E-03	1.36E-03	6.96E-07	4.05E-05	8.52E-02		1.93E+04		2.27E+02	2.3E+02	J
Aliphatics >C8-C10	1.36E-03	1.36E-03	6.79E-07	3.96E-05	1.33E-01		1.06E+03		7.93E+00	7.9E+00	J
Aliphatics >C10-C12	1.36E-03	1.36E-03	6.70E-07	3.91E-05	1.98E-01		1.10E+03		5.53E+00	5.5E+00	J
Aliphatics >C12-C16	1.36E-03	1.36E-03	6.56E-07	3.82E-05	8.43E-01		1.10E+03		1.30E+00	1.3E+00	J
Aliphatics >C16-C35											
Aromatics >C8-C10	1.36E-03	1.36E-03	5.30E-06	2.59E-04	3.07E-03		2.19E+02		7.13E+01	7.1E+01	J
Aromatics >C10-C12	1.36E-03	1.36E-03	1.66E-05	5.79E-04	1.25E-03		2.19E+02		1.75E+02	1.8E+02	J
Aromatics >C12-C16	1.37E-03	1.37E-03	4.28E-05	9.02E-04	5.36E-04		2.19E+02		4.09E+02	4.1E+02	J
Aromatics >C16-C21											
Aromatics >C21-C35											

LDEQ RECAP
WORKSHEET 14
GWesi
(mg/l)

Groundwater located beneath enclosed structure-Industrial					Derivation of Management Option 2 RS						
Revision Date: 08/04/2003					Run date:	10/17/2003					
INPUTS TO GROUNDWATER BENEATH ENCLOSED-STRUCTURE MODEL-INDUSTRIAL						Site-Specific					
volumetric air content in foundation/wall cracks					nacrack =	0.14849057	cm3-air/cm3-total vol				
volumetric water content in foundation/wall cracks					nwcrack =	0.21	cm3-water/cm3-total vol				
total porosity of foundation/wall cracks					nf =	0.35849057	cm3/cm3				
volumetric air content in capillary fringe					nacap =	0.015	cm3-air/cm3-soil				
volumetric water content in capillary fringe					nwcap =	0.345	cm3-water/cm3-soil				
total porosity of capillary fringe soil					nc =	0.36	cm3/cm3				
thickness of capillary fringe					hcap =	5	cm				
thickness of vadose zone					hv =	295	cm				
depth to groundwater					Lgw =	300	cm				
enclosed-structure air exchange rate					ER =	0.00023	1/s				
enclosed-structure volume/infiltration area ratio					Lb =	300	cm				
areal fraction of cracks in foundation/walls					FC =	0.01	cm2-cracks/cm2-total area				
enclosed-structure foundation or wall thickness					Lcrack =	15	cm				
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2											
Dcrack = Da*nacrack^3.33/nf^2+Dw*1/(H*41)*nwcrack^3.33/nf^2											
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2											
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)											
VFgwesi = [H*41*(Dws/Lgw)/(ER*Lb)]/[1+(Dws/Lgw)/(ER*Lb)+(Dws/Lgw)/((Dcrack/Lcrack)*FC)]*1000											
Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)											
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)											
GWesi = Cai*0.001/VFgwesi											
	Ds	Dcrack	Dcap	Dws	VFgwesi	Cai	Cai	GWesi	GWesi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(cm2/s)	(cm2/s)	(mg/m3/mg/l)	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/l)	N-O(mg/l)	(C or N)	
TPH-GRO (C6-C10)							2.19E+02			7.9E+00	
TPH-DRO (C10-C28)											
TPH-ORO (>C28)											
J - Risk-based value calculated with one of the equations EQ 56 thru 59.											
K - Louisiana Toxic Air Pollutant Ambient Air Standards (LAC 33:III.5112 Table 51.2).											

LDEQ RECAP
WORKSHEET 15
GWairni
(mg/l)

Volatile releases from groundwater to ambient air-Non-industrial					Derivation of Management Option 2 RS				
Revision Date: 08/04/2003					Run date:	10/17/2003			
INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-NONINDUSTRIAL						Site-Specific			
volumetric air content in capillary fringe					nacap =	0.015	cm3-air/cm3-soil		
volumetric water content in capillary fringe					nwcap =	0.345	cm3-water/cm3-soil		
total porosity of capillary fringe soil					nc =	0.36	cm3/cm3		
thickness of capillary fringe					hcap =	5	cm		
thickness of vadose zone					hv =	295	cm		
depth to groundwater					Lgw =	300	cm		
wind speed above ground surface in ambient mixing zone					Uair =	225	cm/s		
width of source area parallel to wind					W =	4511	cm		
ambient air mixing zone height					dair =	200	cm		
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2									
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2									
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)									
VFgwairni = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]									
Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)									
Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)									
GWairni = Cani*0.001/VFgwairni									

	Ds	Dcap	Dws	VFgwairni	Cani	Cani	GWairi	GWairi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(cm2/s)	(mg/m3/mg/l)	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/l)	N-O(mg/l)	(C or N)	
Acenaphthene	6.24E-04	2.70E-04	6.10E-04	1.30E-06	#VALUE!	2.19E+02	#VALUE!	1.69E+05	1.7E+05	J
Acenaphthylene	6.65E-04	3.60E-04	6.56E-04	1.02E-06	#VALUE!	2.19E+02	#VALUE!	2.14E+05	2.1E+05	J
Acetone	1.99E-03	1.60E-03	1.98E-03	1.05E-06	#VALUE!	3.65E+02	#VALUE!	3.46E+05	3.5E+05	J
Aldrin										
Aniline										
Anthracene	5.65E-04	6.48E-04	5.66E-04	5.04E-07	#VALUE!	1.10E+03	#VALUE!	2.17E+06	2.2E+06	J
Antimony										
Arsenic										
Barium										
Benzene	1.20E-03	1.02E-05	4.07E-04	3.09E-05	1.20E+01		3.88E+02		3.9E+02	K
Benz(a)anthracene										
Benzo(a)pyrene										
Benzo(b)fluoranthene										
Benzo(k)fluoranthene										
Beryllium										
Biphenyl,1,1-	5.77E-04	1.48E-04	5.50E-04	2.26E-06		2.38E+01		1.05E+04	1.1E+04	K
Bis(2-chloroethyl)ether	1.38E-03	2.28E-03	1.39E-03	3.42E-07	3.00E-01		8.76E+02		8.8E+02	K
Bis(2-chloroisopropyl)ether	8.69E-04	3.19E-04	8.45E-04	1.31E-06	1.90E-01	1.46E+02	1.45E+02	1.12E+05	1.4E+02	J
Bis(2-ethyl-hexyl)phthalate										
Bromodichloromethane	4.12E-04	3.62E-05	3.51E-04	7.69E-06	1.07E-01	7.30E+01	1.39E+01	9.49E+03	1.4E+01	J
Bromoform	2.23E-04	1.05E-04	2.18E-04	1.60E-06	1.72E+00	7.30E+01	1.08E+03	4.56E+04	1.1E+03	J
Bromomethane	9.90E-04	1.11E-05	4.01E-04	3.40E-05	#VALUE!	5.22E+00	#VALUE!	1.53E+02	1.5E+02	J
Butyl benzyl phthalate										
Cadmium										
Carbon Disulfide	1.41E-03	2.47E-06	1.34E-04	5.58E-05		7.14E+01		1.28E+03	1.3E+03	K
Carbon Tetrachloride	1.06E-03	2.08E-06	1.12E-04	4.66E-05	6.67E+00		1.43E+02		1.4E+02	K
Chlordane										
Chloroaniline,p-										
Chlorobenzene	9.94E-04	1.33E-05	4.45E-04	2.26E-05		1.10E+03		4.87E+04	4.9E+04	K
Chlorodibromomethane	2.80E-04	7.31E-05	2.68E-04	2.87E-06	7.90E-02	7.30E+01	2.75E+01	2.54E+04	2.8E+01	J
Chloroethane (Ethylchloride)	3.68E-03	8.87E-06	4.66E-04	5.62E-05		6.29E+04		1.12E+06	1.1E+06	K
Chloroform	1.41E-03	1.55E-05	5.65E-04	2.84E-05	4.30E+00		1.51E+02		1.5E+02	K
Chloromethane	1.71E-03	4.84E-06	2.49E-04	3.00E-05	5.56E+01		1.85E+03		1.9E+03	K

Volatile releases from groundwater to ambient air-Non-industrial	Derivation of Management Option 2 RS		
Revision Date: 08/04/2003	Run date:	10/17/2003	
INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
wind speed above ground surface in ambient mixing zone	Uair =	225	cm/s
width of source area parallel to wind	W =	4511	cm
ambient air mixing zone height	dair =	200	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)
VFgwairni = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)
Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

GWairni = Cani*0.001/VFgwairni

COMPOUND	Ds (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwairni (mg/m3/mg/l)	Cani C-O (ug/m3)	Cani N-O (ug/m3)	GWairi C-O(mg/l)	GWairi N-O(mg/l)	min value (C or N)	Note
Chloronaphthalene,2-	5.01E-04	1.55E-04	4.83E-04	2.05E-06	#VALUE!	2.92E+02	#VALUE!	1.42E+05	1.4E+05	J
Chlorophenol,2-	7.06E-04	1.32E-04	6.58E-04	3.52E-06	#VALUE!	1.83E+01	#VALUE!	5.18E+03	5.2E+03	J
Chromium(III)										
Chromium(VI)										
Chrysene										
Cobalt										
Copper										
Cyanide (free)										
DDD										
DDE										
DDT										
Dibenz(a,h)anthracene										
Dibenzofuran	8.47E-04	2.51E-03	8.57E-04	1.53E-07	#VALUE!	1.46E+01	#VALUE!	9.57E+04	9.6E+04	J
Dibromo-3-chloropropane,1,2-										
Dichlorobenzene,1,2-	9.41E-04	2.31E-05	5.66E-04	1.47E-05	#VALUE!	2.08E+02	#VALUE!	1.41E+04	1.4E+04	J
Dichlorobenzene,1,3-	8.74E-04	1.21E-05	4.00E-04	1.81E-05	#VALUE!	3.29E+00	#VALUE!	1.82E+02	1.8E+02	J
Dichlorobenzene,1,4-	9.40E-04	1.81E-05	5.09E-04	1.69E-05		1.43E+03		8.44E+04	8.4E+04	K
Dichlorobenzidine,3,3-										
Dichloroethane,1,1-	1.01E-03	1.06E-05	3.94E-04	3.03E-05	#VALUE!	5.22E+02	#VALUE!	1.72E+04	1.7E+04	J
Dichloroethane,1,2-	1.42E-03	5.57E-05	1.01E-03	1.35E-05	3.85E+00		2.84E+02		2.8E+02	K
Dichloroethene,1,1-	1.22E-03	2.75E-06	1.46E-04	5.21E-05	#VALUE!	2.08E+02	#VALUE!	3.99E+03	4.0E+03	J
Dichloroethene,cis,1,2-	1.00E-03	1.55E-05	4.87E-04	2.72E-05	#VALUE!	3.65E+01	#VALUE!	1.34E+03	1.3E+03	J
Dichloroethene,trans,1,2-	9.61E-04	7.36E-06	3.04E-04	3.91E-05	#VALUE!	7.30E+01	#VALUE!	1.87E+03	1.9E+03	J
Dichlorophenol,2,4-										
Dichloropropane,1,2-	1.06E-03	1.75E-05	5.33E-04	2.04E-05		8.26E+03		4.04E+05	4.0E+05	K
Dichloropropene,1,3-	8.56E-04	3.11E-05	5.94E-04	1.44E-05		1.07E+02		7.43E+03	7.4E+03	K
Dieldrin										
Diethylphthalate										
Dimethylphenol,2,4-										
Dimethylphthalate										
Di-n-octylphthalate										
Dinitrobenzene,1,3-										
Dinitrophenol,2,4-										

LDEQ RECAP
WORKSHEET 15
GWairni
(mg/l)

Volatile releases from groundwater to ambient air-Non-industrial	Derivation of Management Option 2 RS		
Revision Date: 08/04/2003	Run date:	10/17/2003	
INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
wind speed above ground surface in ambient mixing zone	Uair =	225	cm/s
width of source area parallel to wind	W =	4511	cm
ambient air mixing zone height	dair =	200	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)
VFgwairni = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)
Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

GWairni = Cani*0.001/VFgwairni

COMPOUND	Ds (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwairni (mg/m3/mg/l)	Cani C-O (ug/m3)	Cani N-O (ug/m3)	GWairi C-O(mg/l)	GWairi N-O(mg/l)	min value (C or N)	Note
Dinitrotoluene,2,6-										
Dinitrotoluene,2,4-										
Dinoseb										
Endosulfan										
Endrin										
Ethyl benzene	1.02E-03	5.87E-06	2.63E-04	2.84E-05		1.03E+04		3.63E+05	3.6E+05	K
Fluoranthene										
Fluorene	6.23E-04	6.74E-04	6.24E-04	5.43E-07	#VALUE!	1.46E+02	#VALUE!	2.69E+05	2.7E+05	J
Heptachlor										
Heptachlor epoxide										
Hexachlorobenzene	7.41E-04	2.47E-05	4.99E-04	9.03E-06	2.00E-01		2.21E+01		2.2E+01	K
Hexachlorobutadiene										
Hexachlorocyclohexane,alpha										
Hexachlorocyclohexane,beta										
Hexachlorocyclohexane,gamma										
Hexachlorocyclopentadiene	2.19E-04	1.56E-06	6.58E-05	2.43E-05	#VALUE!	2.08E-01	#VALUE!	8.55E+00	8.5E+00	J
Hexachloroethane	3.58E-05	9.52E-06	3.42E-05	1.82E-06	2.50E+01		1.37E+04		1.4E+04	K
Indeno(1,2,3-cd)pyrene										
Isobutyl alcohol										
Isophorone										
Lead (inorganic)										
Mercury (inorganic)										
Methoxychlor										
Methylene chloride	1.38E-03	2.97E-05	7.84E-04	2.35E-05	2.13E+02		9.04E+03		9.0E+03	K
Methyl ethyl ketone	1.28E-03	9.52E-04	1.27E-03	9.77E-07		1.40E+04		1.43E+07	1.4E+07	K
Methyl isobutyl ketone	1.08E-03	3.04E-04	1.03E-03	1.98E-06		4.88E+03		2.46E+06	2.5E+06	K
Methylnaphthalene,2-	7.94E-04	7.36E-04	7.93E-04	6.30E-07	#VALUE!	3.14E+00	#VALUE!	4.98E+03	5.0E+03	J
MTBE (methyl tert-butyl ether)	1.40E-03	9.80E-05	1.15E-03	9.24E-06	#VALUE!	3.13E+03	#VALUE!	3.39E+05	3.4E+05	J
Naphthalene	8.17E-04	8.48E-05	7.15E-04	4.73E-06	#VALUE!	3.14E+00	#VALUE!	6.64E+02	6.6E+02	J
Nickel										
Nitrate										
Nitrite										
Nitroaniline,2-	9.76E-04	4.15E-04	9.54E-04	1.27E-06	#VALUE!	1.06E-01	#VALUE!	8.33E+01	8.3E+01	J

LDEQ RECAP
WORKSHEET 15
GWairni
(mg/l)

Volatile releases from groundwater to ambient air-Non-industrial

Derivation of Management Option 2 RS

Revision Date: 08/04/2003

Run date: 10/17/2003

INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-NONINDUSTRIAL		Site-Specific	
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
wind speed above ground surface in ambient mixing zone	Uair =	225	cm/s
width of source area parallel to wind	W =	4511	cm
ambient air mixing zone height	dair =	200	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2

Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)

VFgwairni = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]

Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)

Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)

GWairni = Cani*0.001/VFgwairni

COMPOUND	Ds (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwairni (mg/m3/mg/l)	Cani C-O (ug/m3)	Cani N-O (ug/m3)	GWairi C-O(mg/l)	GWairi N-O(mg/l)	min value (C or N)	Note
Nitroaniline,3-	5.38E-02	2.74E-01	5.45E-02	1.10E-07	#VALUE!	1.10E+01	#VALUE!	9.98E+04	1.0E+05	J
Nitroaniline,4-										
Nitrobenzene	1.41E-03	1.95E-03	1.41E-03	4.65E-07		1.19E+02		2.56E+05	2.6E+05	K
Nitrophenol,4-										
Nitrosodi-n-propylamine,n-										
N-nitrosodiphenylamine										
Pentachlorophenol										
Phenanthrene	7.89E-04	1.81E-03	7.96E-04	2.54E-07	#VALUE!	1.10E+03	#VALUE!	4.31E+06	4.3E+06	J
Phenol	2.52E-02	1.25E-01	2.55E-02	1.39E-07	#VALUE!	1.10E+03	#VALUE!	7.89E+06	7.9E+06	J
Polychlorinated biphenyls										
Pyrene	1.06E-03	3.58E-03	1.07E-03	1.62E-07	#VALUE!	1.10E+02	#VALUE!	6.77E+05	6.8E+05	J
Selenium										
Silver										
Styrene	9.67E-04	1.63E-05	4.90E-04	1.85E-05		1.00E+03		5.42E+04	5.4E+04	K
Tetrachlorobenzene,1,2,4,5-										
Tetrachloroethane,1,1,1,2-	8.18E-04	1.56E-05	4.40E-04	1.45E-05	1.00E-01		6.91E+00		6.9E+00	K
Tetrachloroethane,1,1,2,2-	9.88E-04	1.25E-04	8.86E-04	4.19E-06	1.70E+00		4.06E+02		4.1E+02	K
Tetrachloroethylene	9.78E-04	2.89E-06	1.48E-04	3.73E-05	1.10E+02		2.95E+03		3.0E+03	K
Tetrachlorophenol,2,3,4,6-										
Thallium										
Toluene	1.18E-03	7.61E-06	3.31E-04	3.01E-05		4.00E+02		1.33E+04	1.3E+04	K
Toxaphene										
Trichlorobenzene,1,2,4-	4.13E-04	3.17E-05	3.44E-04	6.70E-06	#VALUE!	2.08E+02	#VALUE!	3.11E+04	3.1E+04	J
Trichloroethane,1,1,1-	1.06E-03	3.29E-06	1.67E-04	3.93E-05	#VALUE!	1.04E+03	#VALUE!	2.65E+04	2.7E+04	J
Trichloroethane,1,1,2-	1.07E-03	5.29E-05	8.10E-04	1.01E-05	6.30E+00		6.22E+02		6.2E+02	K
Trichloroethene	1.07E-03	5.32E-06	2.47E-04	3.49E-05	5.90E+01		1.69E+03		1.7E+03	K
Trichlorofluoromethane	1.18E-03	1.11E-06	6.31E-05	8.39E-05	#VALUE!	7.30E+02	#VALUE!	8.70E+03	8.7E+03	J
Trichlorophenol,2,4,5-										
Trichlorophenol,2,4,6-										
Vanadium										
Vinyl chloride	1.44E-03	9.38E-07	5.42E-05	2.01E-05	1.20E+00		5.98E+01		6.0E+01	K
Xylene(mixed)	9.51E-04	6.04E-06	2.64E-04	2.74E-05	#VALUE!	1.06E+02	#VALUE!	3.86E+03	3.9E+03	J
Zinc										

LDEQ RECAP
WORKSHEET 15
GWairni
(mg/l)

Volatile releases from groundwater to ambient air-Non-industrial					Derivation of Management Option 2 RS				
Revision Date: 08/04/2003					Run date:	10/17/2003			
INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-NONINDUSTRIAL						Site-Specific			
volumetric air content in capillary fringe					nacap =	0.015	cm3-air/cm3-soil		
volumetric water content in capillary fringe					nwcap =	0.345	cm3-water/cm3-soil		
total porosity of capillary fringe soil					nc =	0.36	cm3/cm3		
thickness of capillary fringe					hcap =	5	cm		
thickness of vadose zone					hv =	295	cm		
depth to groundwater					Lgw =	300	cm		
wind speed above ground surface in ambient mixing zone					Uair =	225	cm/s		
width of source area parallel to wind					W =	4511	cm		
ambient air mixing zone height					dair =	200	cm		
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2									
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2									
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)									
VFgwairni = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]									
Cani C-O = (TR*ATc*365*1000)/(EFni*SFi*IRAadj)									
Cani N-O = (THQ*RfDi*BWa*ATnni*365*1000)/(IRAa*EFni*EDni)									
GWairni = Cani*0.001/VFgwairni									

	Ds	Dcap	Dws	VFgwairni	Cani	Cani	GWairi	GWairi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(cm2/s)	(mg/m3/mg/l)	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/l)	N-O(mg/l)	(C or N)	
Aliphatics C6-C8	1.36E-03	6.96E-07	4.05E-05	6.77E-04		1.93E+04		2.86E+04	2.9E+04	J
Aliphatics >C8-C10	1.36E-03	6.79E-07	3.96E-05	1.06E-03		1.06E+03		1.00E+03	1.0E+03	J
Aliphatics >C10-C12	1.36E-03	6.70E-07	3.91E-05	1.57E-03		1.10E+03		6.98E+02	7.0E+02	J
Aliphatics >C12-C16	1.36E-03	6.56E-07	3.82E-05	6.65E-03		1.10E+03		1.65E+02	1.6E+02	J
Aliphatics >C16-C35										
Aromatics >C8-C10	1.36E-03	5.30E-06	2.59E-04	4.14E-05		2.19E+02		5.29E+03	5.3E+03	J
Aromatics >C10-C12	1.36E-03	1.66E-05	5.79E-04	2.71E-05		2.19E+02		8.09E+03	8.1E+03	J
Aromatics >C12-C16	1.37E-03	4.28E-05	9.02E-04	1.59E-05		2.19E+02		1.37E+04	1.4E+04	J
Aromatics >C16-C21										
Aromatics >C21-C35										
TPH-GRO (C6-C10)						2.19E+02			1.0E+03	
TPH-DRO (C10-C28)										
TPH-ORO (>C28)										

J - Risk-based value calculated with one of the equations EQ 56 thru 59.

K - Louisiana Toxic Air Pollutant Ambient Air Standards (LAC 33:III.5112 Table 51.2).

LDEQ RECAP
WORKSHEET 16
GWairi
(mg/l)

Volatile releases from groundwater to ambient air-Industrial		Derivation of Management Option 2 RS	
Revision Date: 08/04/2003		Run date:	10/17/2003
INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
wind speed above ground surface in ambient mixing zone	Uair =	225	cm/s
width of source area parallel to wind	W =	4511	cm
ambient air mixing zone height	dair =	200	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2

Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)

VFgwairi = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)

Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

GWairi = Cai*0.001/VFgwairi

COMPOUND	Ds (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwairi (mg/m3/mg/l)	Cai C-O (ug/m3)	Cai N-O (ug/m3)	GWairi C-O(mg/l)	GWairi N-O(mg/l)	min value (C or N)	Note
Acenaphthene	6.24E-04	2.70E-04	6.10E-04	1.30E-06	#VALUE!	3.07E+02	#VALUE!	2.37E+05	2.4E+05	J
Acenaphthylene	6.65E-04	3.60E-04	6.56E-04	1.02E-06	#VALUE!	3.07E+02	#VALUE!	2.99E+05	3.0E+05	J
Acetone	1.99E-03	1.60E-03	1.98E-03	1.05E-06	#VALUE!	5.11E+02	#VALUE!	4.85E+05	4.8E+05	J
Aldrin										
Aniline										
Anthracene	5.65E-04	6.48E-04	5.66E-04	5.04E-07	#VALUE!	1.53E+03	#VALUE!	3.04E+06	3.0E+06	J
Antimony										
Arsenic										
Barium										
Benzene	1.20E-03	1.02E-05	4.07E-04	3.09E-05	1.20E+01		3.88E+02		3.9E+02	K
Benz(a)anthracene										
Benzo(a)pyrene										
Benzo(b)fluoranthene										
Benzo(k)fluoranthene										
Beryllium										
Biphenyl,1,1-	5.77E-04	1.48E-04	5.50E-04	2.26E-06		2.38E+01		1.05E+04	1.1E+04	K
Bis(2-chloroethyl)ether	1.38E-03	2.28E-03	1.39E-03	3.42E-07	3.00E-01		8.76E+02		8.8E+02	K
Bis(2-chloroisopropyl)ether	8.69E-04	3.19E-04	8.45E-04	1.31E-06	4.09E-01	2.04E+02	3.12E+02	1.56E+05	3.1E+02	J
Bis(2-ethyl-hexyl)phthalate										
Bromodichloromethane	4.12E-04	3.62E-05	3.51E-04	7.69E-06	2.31E-01	1.02E+02	3.00E+01	1.33E+04	3.0E+01	J
Bromoform	2.23E-04	1.05E-04	2.18E-04	1.60E-06	3.72E+00	1.02E+02	2.32E+03	6.38E+04	2.3E+03	J
Bromomethane	9.90E-04	1.11E-05	4.01E-04	3.40E-05	#VALUE!	7.31E+00	#VALUE!	2.15E+02	2.1E+02	J
Butyl benzyl phthalate										
Cadmium										
Carbon Disulfide	1.41E-03	2.47E-06	1.34E-04	5.58E-05		7.14E+01		1.28E+03	1.3E+03	K
Carbon Tetrachloride	1.06E-03	2.08E-06	1.12E-04	4.66E-05	6.67E+00		1.43E+02		1.4E+02	K
Chlordane										
Chloroaniline,p-										
Chlorobenzene	9.94E-04	1.33E-05	4.45E-04	2.26E-05		1.10E+03		4.87E+04	4.9E+04	K
Chlorodibromomethane	2.80E-04	7.31E-05	2.68E-04	2.87E-06	1.70E-01	1.02E+02	5.93E+01	3.56E+04	5.9E+01	J
Chloroethane (Ethylchloride)	3.68E-03	8.87E-06	4.66E-04	5.62E-05		6.29E+04		1.12E+06	1.1E+06	K
Chloroform	1.41E-03	1.55E-05	5.65E-04	2.84E-05	4.30E+00		1.51E+02		1.5E+02	K
Chloromethane	1.71E-03	4.84E-06	2.49E-04	3.00E-05	5.56E+01		1.85E+03		1.9E+03	K

Volatile releases from groundwater to ambient air-Industrial		Derivation of Management Option 2 RS	
Revision Date: 08/04/2003		Run date:	10/17/2003
INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
wind speed above ground surface in ambient mixing zone	Uair =	225	cm/s
width of source area parallel to wind	W =	4511	cm
ambient air mixing zone height	dair =	200	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2

Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)

VFgwairi = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)

Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

GWairi = Cai*0.001/VFgwairi

COMPOUND	Ds (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwairi (mg/m3/mg/l)	Cai C-O (ug/m3)	Cai N-O (ug/m3)	GWairi C-O(mg/l)	GWairi N-O(mg/l)	min value (C or N)	Note
Chloronaphthalene,2-	5.01E-04	1.55E-04	4.83E-04	2.05E-06	#VALUE!	4.09E+02	#VALUE!	1.99E+05	2.0E+05	J
Chlorophenol,2-	7.06E-04	1.32E-04	6.58E-04	3.52E-06	#VALUE!	2.56E+01	#VALUE!	7.25E+03	7.2E+03	J
Chromium(III)										
Chromium(VI)										
Chrysene										
Cobalt										
Copper										
Cyanide (free)										
DDD										
DDE										
DDT										
Dibenz(a,h)anthracene										
Dibenzofuran	8.47E-04	2.51E-03	8.57E-04	1.53E-07	#VALUE!	2.04E+01	#VALUE!	1.34E+05	1.3E+05	J
Dibromo-3-chloropropane,1,2-										
Dichlorobenzene,1,2-	9.41E-04	2.31E-05	5.66E-04	1.47E-05	#VALUE!	2.91E+02	#VALUE!	1.98E+04	2.0E+04	J
Dichlorobenzene,1,3-	8.74E-04	1.21E-05	4.00E-04	1.81E-05	#VALUE!	4.60E+00	#VALUE!	2.54E+02	2.5E+02	J
Dichlorobenzene,1,4-	9.40E-04	1.81E-05	5.09E-04	1.69E-05		1.43E+03		8.44E+04	8.4E+04	K
Dichlorobenzidine,3,3-										
Dichloroethane,1,1-	1.01E-03	1.06E-05	3.94E-04	3.03E-05	#VALUE!	7.31E+02	#VALUE!	2.41E+04	2.4E+04	J
Dichloroethane,1,2-	1.42E-03	5.57E-05	1.01E-03	1.35E-05	3.85E+00		2.84E+02		2.8E+02	K
Dichloroethene,1,1-	1.22E-03	2.75E-06	1.46E-04	5.21E-05	#VALUE!	2.91E+02	#VALUE!	5.59E+03	5.6E+03	J
Dichloroethene,cis,1,2-	1.00E-03	1.55E-05	4.87E-04	2.72E-05	#VALUE!	5.11E+01	#VALUE!	1.88E+03	1.9E+03	J
Dichloroethene,trans,1,2-	9.61E-04	7.36E-06	3.04E-04	3.91E-05	#VALUE!	1.02E+02	#VALUE!	2.61E+03	2.6E+03	J
Dichlorophenol,2,4-										
Dichloropropane,1,2-	1.06E-03	1.75E-05	5.33E-04	2.04E-05		8.26E+03		4.04E+05	4.0E+05	K
Dichloropropene,1,3-	8.56E-04	3.11E-05	5.94E-04	1.44E-05		1.07E+02		7.43E+03	7.4E+03	K
Dieldrin										
Diethylphthalate										
Dimethylphenol,2,4-										
Dimethylphthalate										
Di-n-octylphthalate										
Dinitrobenzene,1,3-										
Dinitrophenol,2,4-										

LDEQ RECAP
WORKSHEET 16
GWairi
(mg/l)

Volatile releases from groundwater to ambient air-Industrial		Derivation of Management Option 2 RS	
Revision Date: 08/04/2003		Run date:	10/17/2003
INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
wind speed above ground surface in ambient mixing zone	Uair =	225	cm/s
width of source area parallel to wind	W =	4511	cm
ambient air mixing zone height	dair =	200	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2

Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2

Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)

VFgwairi = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)

Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

GWairi = Cai*0.001/VFgwairi

COMPOUND	Ds (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwairi (mg/m3/mg/l)	Cai C-O (ug/m3)	Cai N-O (ug/m3)	GWairi C-O(mg/l)	GWairi N-O(mg/l)	min value (C or N)	Note
Dinitrotoluene,2,6-										
Dinitrotoluene,2,4-										
Dinoseb										
Endosulfan										
Endrin										
Ethyl benzene	1.02E-03	5.87E-06	2.63E-04	2.84E-05		1.03E+04		3.63E+05	3.6E+05	K
Fluoranthene										
Fluorene	6.23E-04	6.74E-04	6.24E-04	5.43E-07	#VALUE!	2.04E+02	#VALUE!	3.76E+05	3.8E+05	J
Heptachlor										
Heptachlor epoxide										
Hexachlorobenzene	7.41E-04	2.47E-05	4.99E-04	9.03E-06	2.00E-01		2.21E+01		2.2E+01	K
Hexachlorobutadiene										
Hexachlorocyclohexane,alpha										
Hexachlorocyclohexane,beta										
Hexachlorocyclohexane,gamma										
Hexachlorocyclopentadiene	2.19E-04	1.56E-06	6.58E-05	2.43E-05	#VALUE!	2.91E-01	#VALUE!	1.20E+01	1.2E+01	J
Hexachloroethane	3.58E-05	9.52E-06	3.42E-05	1.82E-06	2.50E+01		1.37E+04		1.4E+04	K
Indeno(1,2,3-cd)pyrene										
Isobutyl alcohol										
Isophorone										
Lead (inorganic)										
Mercury (inorganic)										
Methoxychlor										
Methylene chloride	1.38E-03	2.97E-05	7.84E-04	2.35E-05	2.13E+02		9.04E+03		9.0E+03	K
Methyl ethyl ketone	1.28E-03	9.52E-04	1.27E-03	9.77E-07		1.40E+04		1.43E+07	1.4E+07	K
Methyl isobutyl ketone	1.08E-03	3.04E-04	1.03E-03	1.98E-06		4.88E+03		2.46E+06	2.5E+06	K
Methylnaphthalene,2-	7.94E-04	7.36E-04	7.93E-04	6.30E-07	#VALUE!	4.39E+00	#VALUE!	6.98E+03	7.0E+03	J
MTBE (methyl tert-butyl ether)	1.40E-03	9.80E-05	1.15E-03	9.24E-06	#VALUE!	4.38E+03	#VALUE!	4.74E+05	4.7E+05	J
Naphthalene	8.17E-04	8.48E-05	7.15E-04	4.73E-06	#VALUE!	4.39E+00	#VALUE!	9.29E+02	9.3E+02	J
Nickel										
Nitrate										
Nitrite										
Nitroaniline,2-	9.76E-04	4.15E-04	9.54E-04	1.27E-06	#VALUE!	1.48E-01	#VALUE!	1.17E+02	1.2E+02	J

LDEQ RECAP
WORKSHEET 16
GWairi
(mg/l)

Volatile releases from groundwater to ambient air-Industrial | Derivation of Management Option 2 RS

Revision Date: 08/04/2003 | Run date: 10/17/2003

INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-INDUSTRIAL		Site-Specific	
volumetric air content in capillary fringe	nacap =	0.015	cm3-air/cm3-soil
volumetric water content in capillary fringe	nwcap =	0.345	cm3-water/cm3-soil
total porosity of capillary fringe soil	nc =	0.36	cm3/cm3
thickness of capillary fringe	hcap =	5	cm
thickness of vadose zone	hv =	295	cm
depth to groundwater	Lgw =	300	cm
wind speed above ground surface in ambient mixing zone	Uair =	225	cm/s
width of source area parallel to wind	W =	4511	cm
ambient air mixing zone height	dair =	200	cm

Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)
VFgwairi = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]

Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)

GWairi = Cai*0.001/VFgwairi

COMPOUND	Ds (cm2/s)	Dcap (cm2/s)	Dws (cm2/s)	VFgwairi (mg/m3/mg/l)	Cai C-O (ug/m3)	Cai N-O (ug/m3)	GWairi C-O(mg/l)	GWairi N-O(mg/l)	min value (C or N)	Note
Nitroaniline,3-	5.38E-02	2.74E-01	5.45E-02	1.10E-07	#VALUE!	1.53E+01	#VALUE!	1.40E+05	1.4E+05	J
Nitroaniline,4-										
Nitrobenzene	1.41E-03	1.95E-03	1.41E-03	4.65E-07		1.19E+02		2.56E+05	2.6E+05	K
Nitrophenol,4-										
Nitrosodi-n-propylamine,n-										
N-nitrosodiphenylamine										
Pentachlorophenol										
Phenanthrene	7.89E-04	1.81E-03	7.96E-04	2.54E-07	#VALUE!	1.53E+03	#VALUE!	6.03E+06	6.0E+06	J
Phenol	2.52E-02	1.25E-01	2.55E-02	1.39E-07	#VALUE!	1.53E+03	#VALUE!	1.10E+07	1.1E+07	J
Polychlorinated biphenyls										
Pyrene	1.06E-03	3.58E-03	1.07E-03	1.62E-07	#VALUE!	1.53E+02	#VALUE!	9.48E+05	9.5E+05	J
Selenium										
Silver										
Styrene	9.67E-04	1.63E-05	4.90E-04	1.85E-05		1.00E+03		5.42E+04	5.4E+04	K
Tetrachlorobenzene,1,2,4,5-										
Tetrachloroethane,1,1,1,2-	8.18E-04	1.56E-05	4.40E-04	1.45E-05	1.00E-01		6.91E+00		6.9E+00	K
Tetrachloroethane,1,1,2,2-	9.88E-04	1.25E-04	8.86E-04	4.19E-06	1.70E+00		4.06E+02		4.1E+02	K
Tetrachloroethylene	9.78E-04	2.89E-06	1.48E-04	3.73E-05	1.10E+02		2.95E+03		3.0E+03	K
Tetrachlorophenol,2,3,4,6-										
Thallium										
Toluene	1.18E-03	7.61E-06	3.31E-04	3.01E-05		4.00E+02		1.33E+04	1.3E+04	K
Toxaphene										
Trichlorobenzene,1,2,4-	4.13E-04	3.17E-05	3.44E-04	6.70E-06	#VALUE!	2.91E+02	#VALUE!	4.35E+04	4.3E+04	J
Trichloroethane,1,1,1-	1.06E-03	3.29E-06	1.67E-04	3.93E-05	#VALUE!	1.46E+03	#VALUE!	3.72E+04	3.7E+04	J
Trichloroethane,1,1,2-	1.07E-03	5.29E-05	8.10E-04	1.01E-05	6.30E+00		6.22E+02		6.2E+02	K
Trichloroethene	1.07E-03	5.32E-06	2.47E-04	3.49E-05	5.90E+01		1.69E+03		1.7E+03	K
Trichlorofluoromethane	1.18E-03	1.11E-06	6.31E-05	8.39E-05	#VALUE!	1.02E+03	#VALUE!	1.22E+04	1.2E+04	J
Trichlorophenol,2,4,5-										
Trichlorophenol,2,4,6-										
Vanadium										
Vinyl chloride	1.44E-03	9.38E-07	5.42E-05	2.01E-05	1.20E+00		5.98E+01		6.0E+01	K
Xylene(mixed)	9.51E-04	6.04E-06	2.64E-04	2.74E-05	#VALUE!	1.48E+02	#VALUE!	5.40E+03	5.4E+03	J
Zinc										

LDEQ RECAP
WORKSHEET 16
GWairi
(mg/l)

Volatile releases from groundwater to ambient air-Industrial					Derivation of Management Option 2 RS					
Revision Date: 08/04/2003					Run date:	10/17/2003				
INPUTS TO GROUNDWATER TO AMBIENT AIR MODEL-INDUSTRIAL					Site-Specific					
volumetric air content in capillary fringe				nacap =	0.015	cm3-air/cm3-soil				
volumetric water content in capillary fringe				nwcap =	0.345	cm3-water/cm3-soil				
total porosity of capillary fringe soil				nc =	0.36	cm3/cm3				
thickness of capillary fringe				hcap =	5	cm				
thickness of vadose zone				hv =	295	cm				
depth to groundwater				Lgw =	300	cm				
wind speed above ground surface in ambient mixing zone				Uair =	225	cm/s				
width of source area parallel to wind				W =	4511	cm				
ambient air mixing zone height				dair =	200	cm				
Ds = Da*na^3.33/n^2+Dw*1/(H*41)*nw^3.33/n^2										
Dcap = Da*nacap^3.33/nc^2+Dw*1/(H*41)*nwcap^3.33/nc^2										
Dws = (hcap+hv)/(hcap/Dcap+hv/Ds)										
VFgwairi = (H*41*1000)/[1+(Uair*dair*Lgw)/(W*Dws)]										
Cai C-O = (TR*BWa*ATc*365*1000)/(SFi*IRAa*EFi*EDi)										
Cai N-O = (THQ*RfDi*BWa*ATni*365*1000)/(IRAa*EFi*EDi)										
GWairi = Cai*0.001/VFgwairi										
	Ds	Dcap	Dws	VFgwairi	Cai	Cai	GWairi	GWairi	min value	Note
COMPOUND	(cm2/s)	(cm2/s)	(cm2/s)	(mg/m3/mg/l)	C-O (ug/m3)	N-O (ug/m3)	C-O(mg/l)	N-O(mg/l)	(C or N)	
Aliphatics C6-C8	1.36E-03	6.96E-07	4.05E-05	6.77E-04		1.93E+04		2.86E+04	2.9E+04	J
Aliphatics >C8-C10	1.36E-03	6.79E-07	3.96E-05	1.06E-03		1.06E+03		1.00E+03	1.0E+03	J
Aliphatics >C10-C12	1.36E-03	6.70E-07	3.91E-05	1.57E-03		1.10E+03		6.98E+02	7.0E+02	J
Aliphatics >C12-C16	1.36E-03	6.56E-07	3.82E-05	6.65E-03		1.10E+03		1.65E+02	1.6E+02	J
Aliphatics >C16-C35										
Aromatics >C8-C10	1.36E-03	5.30E-06	2.59E-04	4.14E-05		2.19E+02		5.29E+03	5.3E+03	J
Aromatics >C10-C12	1.36E-03	1.66E-05	5.79E-04	2.71E-05		2.19E+02		8.09E+03	8.1E+03	J
Aromatics >C12-C16	1.37E-03	4.28E-05	9.02E-04	1.59E-05		2.19E+02		1.37E+04	1.4E+04	J
Aromatics >C16-C21										
Aromatics >C21-C35										
TPH-GRO (C6-C10)						2.19E+02			1.0E+03	
TPH-DRO (C10-C28)										
TPH-ORO (>C28)										
J - Risk-based value calculated with one of the equations EQ 56 thru 59.										
K - Louisiana Toxic Air Pollutant Ambient Air Standards (LAC 33:III.5112 Table 51.2).										

Domenico Analytical Solute Transport Model | **Management Option 1**

LDEQ Risk Evaluation/Corrective Action Progran
Revision date: 07/10/2002
Run date: 10/16/2003

General assumptions:

1. A single continuous source of one chemical compound dissolvec in the groundwater. No NAPL.
2. No initial groundwater contamination.
3. Chemical compound is non-reactive.
4. No biodegradation or retardation occuring.
5. Groundwater flow is in one direction.
6. Saturated zone is homogeneous and isotropic.
7. Contaminant plume is a planar source spreading infinitel laterally in two directions and vertically in one direction.
8. The point "X" is behind the point where "X = v * time since spill".
9. Longitudinal, transverse, and vertical groundwater dispersivitie are based on ASTM E 1739-95 example.
10. The DAF is based on the estimated contaminant concentration (Cxi) at the center line of the plume.

Example Calculation of the Groundwater Dilution Attenuation Facto

Site-specific inputs:

2000	(ft) = X = distance downgradient from source.
5	(ft) = Sd = vertical depth of plume (measured vertical extent of affected groundwater plume or the full thickness of the groundwater stratum).

Defaults:

148	(ft) = Sw = groundwater plume width perpendicular tc groundwater flow.
30	(ft/yr) = Dv = K*i = Darcy groundwater velocity.
0.36	(dimensionless) = O = soil porosity.
83.33333	(ft/yr) = Dv / O = v = linear Darcy groundwater transport velocity.
200	(ft) = X * 0.1 = Ax = longitudinal groundwater dispersivity.
66.66667	(ft) = Ax / 3 = Ay = transverse groundwater dispersivity.
10	(ft) = Ax / 20 = Az = vertical groundwater dispersivity.
1	(dimensionless) = Ri = retardation factor for constituent i.
0	(yr-1) = Yi = first-order degradation constant for constituent i.

Model equation:

(Csi/Cxi) = DAF = 1/[EXP(X/(2*Ax) * (1-SQRT(1+(4*Yi*Ax*Ri/v))))
* Erf(Sw/(4*SQRT(Ay*X))) * Erf(Sd/(2*SQRT(Az*X)))]
= 440.0095 (dimensionless)

LDEQ RECAP
WORKSHEET 7
DF

			Management Option 1 DF for 0.5 acre					
X (ft) = distance				(dimensionless)				
downgradient from								
source =		Sd =	5 ft	10 ft	15 ft	20 ft		
0 - 50			1.5	1	1	1		
50 - 100			2.6	1.5	1.2	1.1		
100 - 150			4.1	2.1	1.6	1.3		
150 - 250			8.4	4.3	3	2.3		
250 - 500			29	15	9.8	7.4		
500 - 750			63	32	21	16		
750 - 1000			111	57	37	28		
1000 - 1250			173	86	58	43		
1250 - 1500			248	124	83	62		
1500 - 1750			337	169	113	84		
1750 - 2000			440	220	147	110		

LDEQ RECAP
WORKSHEET 8
DAF

Domenico Analytical Solute Transport Model		**Management Option 2**
LDEQ Risk Evaluation/Corrective Action Program		
Revision date: 07/10/2002		
Run date:	10/16/2003	
General assumptions:		
1. A single continuous source of one chemical compound dissolved		
in the groundwater. No NAPL.		
2. No initial groundwater contamination.		
3. Chemical compound is non-reactive.		
4. Groundwater flow is in one direction.		
5. Saturated zone is homogeneous and isotropic.		
6. Contaminant plume is a planar source spreading laterally		
infinitely in two directions and vertically finitely in		
one direction.		
7. The point "X" is behind the point where "X = v * time since spill".		
8. The DAF is based on the estimated contaminant concentration (Cxi)		
at the center line of the plume.		
Two possible model cases exist:		
(1) The plume's vertical depth is or is assumed to be the		
full thickness of the groundwater stratum.		
(2) The plume's vertical depth is less than the full		
thickness of the groundwater stratum.		
Example Calculations of the Groundwater Dilution Attenuation Factor		
Site-	(Default	
specific	value)	
inputs		
	148	(ft) = Sw = groundwater plume width perpendicular to
		groundwater flow.
	5	(ft) = Sd = vertical depth of plume (measured vertical extent
		of affected groundwater plume or the full
		thickness of the groundwater stratum).
	10	(ft) = H = thickness of groundwater stratum.
	2000	(ft) = X = distance downgradient from source.
	30	(ft/yr) = Dv = K*i = Darcy groundwater velocity.
	0.36	(dimensionless) = O = soil porosity.
	83.3333333	(ft/yr) = Dv / O = v = linear Darcy groundwater transport
		velocity.
	200	(ft) = Ax = longitudinal groundwater dispersivity.
	66.6666667	(ft) = Ay = transverse groundwater dispersivity.
	10	(ft) = Az = vertical groundwater dispersivity.
	1	(dimensionless) = Ri = retardation factor of constituent i.
	0	(yr-1) = Yi = first-order degradation constant for
		constituent i.

(1) The plume's vertical depth is or is assumed to be the full thickness of the groundwater stratum. Therefore, spreading in the vertical direction is ignored and the Erf term containing Sd is removed from the Domenico model.

Model equation when Sd = H:

(Csi/Cxi)= DAF = 1/[EXP(X/(2*Ax) * (1-SQRT(1+(4*Yi*Ax*Ri/v))))
* Erf(Sw/(4*SQRT(Ay*X)))]
= 8.776006 (dimensionless)

(2) The plume's vertical depth is less than the full thickness of the groundwater stratum. The distance over which vertical spreading can occur is limited to the thickness of the groundwater stratum. The horizontal distance over which vertical spreading can occur is approximated by Xp = ((H-Sd)^2)/Az.

Xp equation:

2.5 (ft) = Xp = (H-Sd)^2/Az
2000 (ft) = X = distance downgradient from source

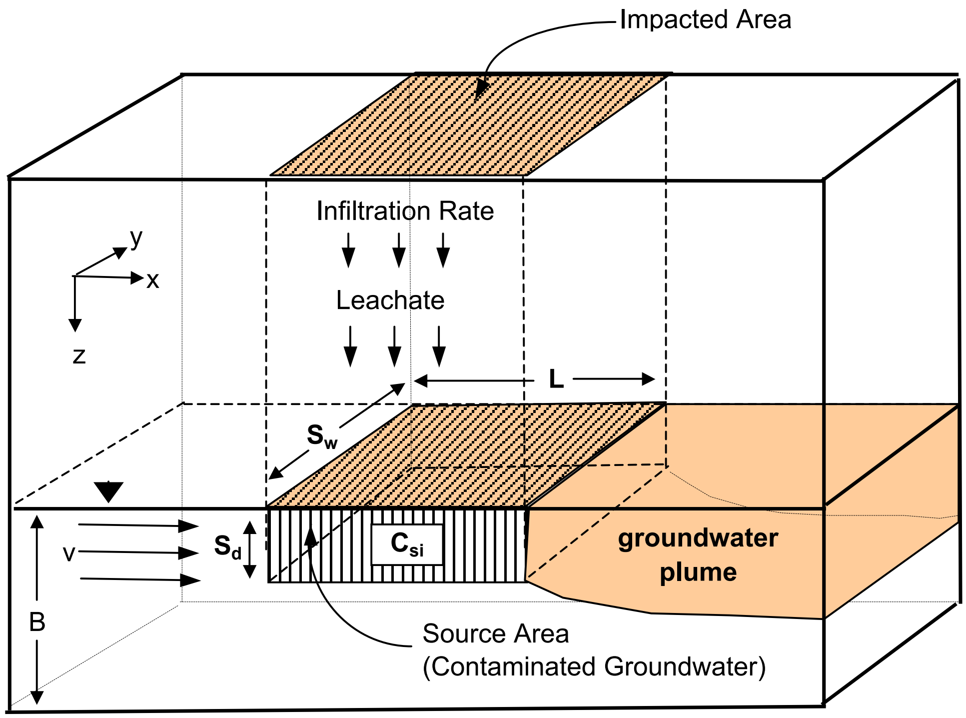
Model equation when X < or = Xp:

(Csi/Cxi)= DAF = 1/[EXP(X/(2*Ax) * (1-SQRT(1+(4*Yi*Ax*Ri/v))))
* Erf(Sw/(4*SQRT(Ay*X))) * Erf(Sd/(2*SQRT(Az*X)))]
= 440.0095 (dimensionless)

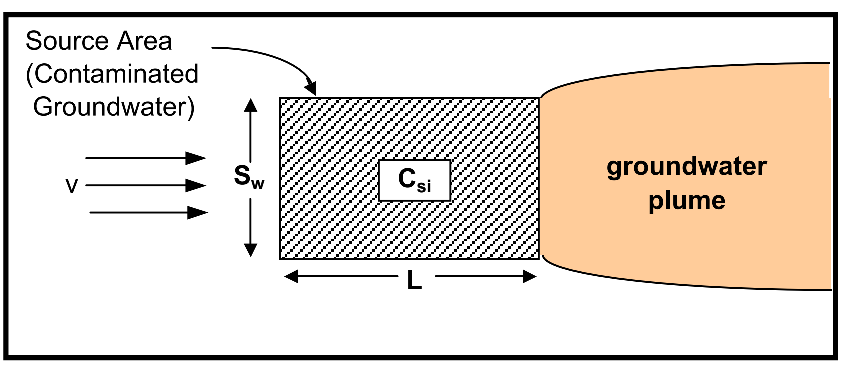
Model equation when X > Xp:

(Csi/Cxi)= DAF = 1/[EXP(X/(2*Ax) * (1-SQRT(1+(4*Yi*Ax*Ri/v))))
* Erf(Sw/(4*SQRT(Ay*X))) * Erf(Sd/(2*SQRT(Az*Xp)))]
= 16.86073 (dimensionless)

Figure H-1:
Schematic Description of Domenico's Model



SECTION



PLAN

ABBREVIATIONS USED:	Sw = source width	v = groundwater flow velocity
	Sd = source depth	Csi = contamination source
	L = source length	B = aquifer thickness

Figure I-1:
Appendix I Site Categorization

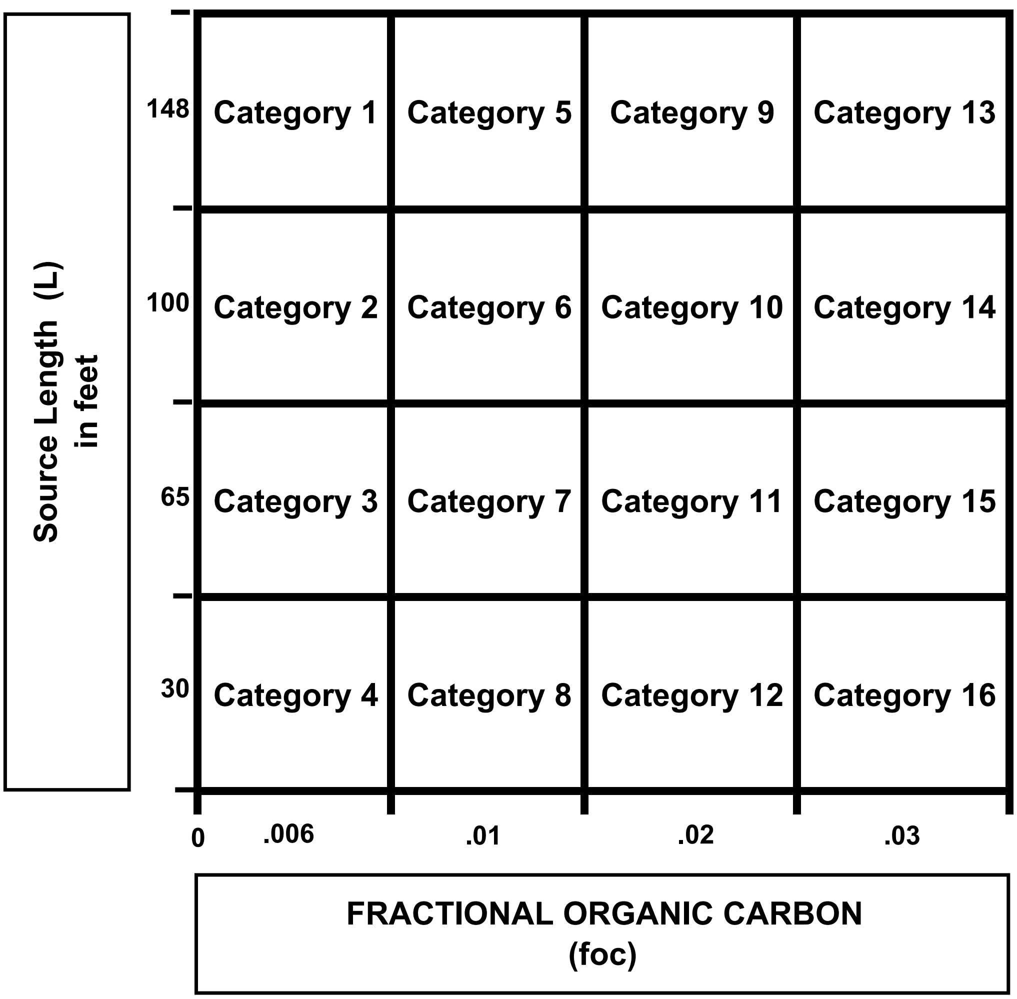
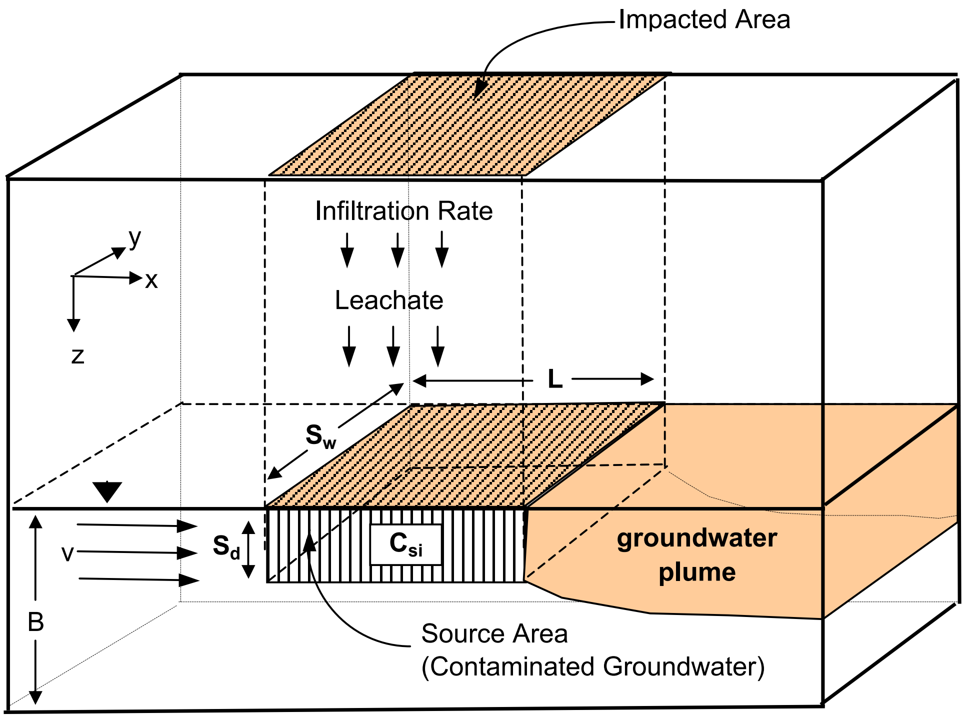


Figure I-2:
Appendix I Dilution Factors

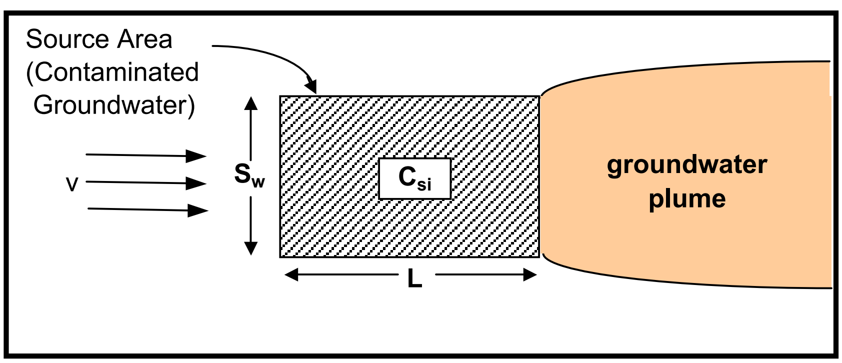
X (ft)=distance from source (POC) to POE		Dilution Factors (dimensionless)				
RANGE (feet) from	to	S_w & L=	30 ft	65 ft	100 ft	148 ft
0	50		2.8	1.2	1.0	1.0
51	100		9.1	2.5	1.5	1.1
101	150		20.0	4.7	2.4	1.5
151	250		53.0	12.0	5.5	2.9
251	500		212.0	46.0	20.0	9.4
501	750		476.0	102.0	44.0	20.0
751	1000		846.0	182.0	78.0	36.0
1001	1250		1321.0	283.0	121.0	56.0
1251	1500		1902.0	408.0	174.0	80.0
1501	1750		2588.0	555.0	237.0	108.0
1751	2000		3380.0	724.0	310.0	141.0

ABBREVIATIONS USED: S_w = source width
L = longitudinal distance of impacted soil as measured from the source (see Fig. I-1)

Figure I-3:
Schematic Description of Domenico's Model



SECTION



PLAN

ABBREVIATIONS USED:	Sw = source width	v = groundwater flow velocity
	Sd = source depth	Csi = contamination source
	L = source length	B = aquifer thickness

APPENDIX I

A SITE-SPECIFIC RECAP EVALUATION FOR TYPICAL UST SITES

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I1.0 APPENDIX I UNDERGROUND STORAGE TANK (UST) RECAP STANDARDS

Relative to sites at large facilities (landfills, RCRA facilities, chemical plants, etc.), UST sites are unique because: (1) most sites are about the same size, (2) the constituents of concern (COC) are relatively limited, (3) the sources of COC are generally limited (i.e. tank hold, pipe chase, and dispenser islands), and (4) the exposure pathways and receptors are similar. Due to these factors and the abundance of information that has been obtained from numerous UST sites in Louisiana and across the country, site-specific RECAP Standards (RS) have been calculated for typical UST sites as an example of a MO-2 analysis that may be developed under RECAP. This analysis is consistent with the requirements for MO-2 evaluations for all sites but uses information that will be gathered during site investigation activities at UST sites. This example may be used to assist in evaluation of the numerous UST sites in Louisiana. A more site-specific MO-2 analysis or a MO-3 analysis may be required by the Department based on site conditions.

The Appendix I RS include $Soil_i$, $Soil_{ni}$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, $Soil_{sat}$, GW_1, GW_2, GW_{3DW}, GW_{3NDW}, and $Water_{sol}$ (refer to Section 2.12 for a description of the RS). The GW_{air} RS shall be obtained from Table 3 of the main document. These RS represent constituent concentrations in soil and groundwater that are protective of human health and the environment. The comparison of the MO-2 Appendix I RS with the soil AOIC and/or groundwater CC serves to provide predictable, consistent guidance regarding when further evaluation and/or corrective action is warranted at a UST site. If the soil AOIC and groundwater CC are less than or equal to the respective MO-2 limiting Appendix I RS, then typically, NFA-ATT is required for soil and groundwater. If the soil AOIC and/or groundwater CC exceeds the limiting RS, then: (1) a more site-specific evaluation of that medium shall be conducted; or (2) corrective action shall be implemented and the MO-2 limiting RS shall be used as the corrective action standard.

Soil and groundwater pathways not addressed by Appendix I: For the volatile emissions from soil to an enclosed structure pathway, the $Soil_{es}$ in Table 2 of the main document may be used or a site-specific $Soil_{es}$ may be developed under MO-2. For the volatile emissions from groundwater to an enclosed structure pathway, the GW_{es} in Table 3 of the main document may be used or a site-specific GW_{es} may be developed under MO-2. For other pathways, a MO-2 assessment, when applicable, shall be conducted in conjunction with the Appendix I assessment.

UST sites evaluated using Appendix I shall be categorized (Category 1-Category 16) in accordance with Figure I-1. Figure I-2 presents the longitudinal dilution factors (DF) that are applied for sites evaluated using Appendix I. The site-specific data **required** to categorize a UST site for evaluation under Appendix I include: (1) the source length (L) (See Figure I-3); (2) source width (S_w) (See Figure I-3); and (3) the fractional organic carbon (f_{oc}) present in soil (the f_{oc} shall be obtained from unimpacted soil that is representative of the impacted area). This information shall be obtained during site investigation activities. For sites where it is expected that the soil to groundwater pathway will be a limiting pathway: (1) a site-specific soil protective of groundwater RS may be developed; or (2) a leach test may be conducted using guidelines in Appendix H.

General data requirements for an Appendix I MO-2 assessment:

(1) Identification of impacted media;
(2) Horizontal and vertical boundaries of the AOI;
(3) Groundwater classification of the impacted zone based on aquifer yield and TDS or location, depth, and use of groundwater wells within a 1-mile radius of the AOI;
(4) CC at the POC and identification of the POE;
(5) Depth to groundwater within the impacted zone and thickness of the groundwater plume (S_d), POE;
(6) Distance to the nearest downgradient property boundary (if applicable);
(7) Designated use of, and distance to, the nearest downgradient surface water body (if applicable);
(8) Area (acres) of impacted soil within the vadose zone, source length of impacted soil within the vadose zone (L), and source width of impacted soil within the vadose zone (S_w)(refer to Figure I-3);
(9) Distribution (lognormal, normal, etc.) of the constituent concentrations present within the AOI (refer to Appendix B for site investigation requirements and Section 2.4 for data quality requirements);
(10) Soil leachate data (SPLP) (optional);
(11) Fractional organic carbon (f_{oc}) present in soil representative of the vadose zone;
(12) Critical effects/target organs for each COC that elicits noncarcinogenic health effects (refer to Appendix G);
(13) Exposure pathways associated with current and future land use (refer to Section 2.7); and
(14) Environmental fate and transport pathways for constituent migration.

For further guidance on conducting an Appendix I evaluation refer to:

(1) Appendix B for site investigation requirements for a MO-2 assessment;
(2) Section 2.6 for the requirements for identifying the AOI and the COC;
(3) Section 2.8 for guidelines on determining the soil AOIC and groundwater CC.
(4) Section 2.12 for a description of the Appendix I RS;
(5) Appendix D for additional guidelines on addressing TPH constituents under the RECAP;
(6) Appendix G for guidance on addressing additive health effects; and
(7) Appendix H for the methods and assumptions used in the development of the Appendix I soil and groundwater RS.

I2.0 CRITERIA FOR MANAGEMENT OF A UST SITE (SOIL AND GROUNDWATER) UNDER APPENDIX I

In order to develop Appendix I UST RS, assumptions were made with regard to: (1) exposure potential at the AOC or the AOI (receptors, exposure pathways, exposure frequency and duration, intake rates, and cumulative exposures); and (2) site characteristics that influence constituent fate and transport (site size, soil characteristics, hydrogeological conditions, etc.). The application of risk-based and cross-media transfer standards is protective only if the AOI shares the same (or reasonably similar) characteristics as those assumed in the development of the standards. Therefore, the Appendix I RS are only applicable at UST sites that meet the criteria listed below.

An AOC or an AOI that meets the criteria presented below may be managed under Appendix I. Application of the Appendix I MO-2 RS at an AOC or an AOI that does not meet all of the criteria for management under MO-2 shall receive Department approval prior to submission of the MO-2 assessment.

I2.1 General Criteria

(1) A non-industrial or industrial exposure scenario is under consideration and there are no sensitive subpopulations on or near the AOI. [The MO-2 Appendix I RS only consider residential and industrial exposure scenarios.]; and

(2) There are no likely human exposure pathways at or adjacent to the AOI other than the ingestion of soil, the ingestion of groundwater, the inhalation of volatile emissions from soil to the ambient air, the inhalation of volatile emissions from groundwater to indoor air during household groundwater use, the inhalation of volatile emissions from groundwater to the ambient air; and dermal contact with soil. The inhalation of volatile emissions from soil to an enclosed structure and the inhalation of volatile emissions from groundwater to an enclosed structure may be addressed under Appendix I using the $Soil_{es}$ and GW_{es} RS presented in Tables 2 and 3, respectively, of the main document. [The MO-2 Appendix I RS do not address the following pathways: ingestion of surface water, the inhalation of volatile emissions from surface water, dermal contact with surface water, the ingestion of sediment, dermal contact with sediment, the inhalation of volatile emissions from sediment, or the ingestion of biota (recreational or subsistence fishing and/or fish/shellfish propagation or production; meat or dairy production, agricultural crop production)].

I2.2 Criteria for Impacted Soil

(1) The area of impacted soil is approximately 0.5 acre or less. [The Q/C parameter for the calculation of the volatilization factor for $Soil_i$ and $Soil_{ni}$ and the S_w parameter for the calculation of the dilution factors (DF) for $Soil_{GW2}$ and $Soil_{GW3}$ are based on an area of impacted soil that is 0.5 acre in size.];

Exception to this criterion: The MO-2 Appendix I RS may be applied to an area of impacted soil greater than 0.5 acres if:

(a) The limiting MO-2 RS is the $Soil_i$ or $Soil_{ni}$ and the COC is an inorganic constituent (the VF is not used in the development of RS for inorganic constituents);

(b) The limiting MO-2 RS is based on a quantitation limit, the soil saturation concentration, the ceiling concentration of 10,000 ppm for TPH, or an approved background concentration (the VF and DF are not applicable); and

(c) The limiting MO-2 RS is based on the $Soil_{GW1}$ (a DF is not applicable).

(2) The impacted soil is in declining conditions, i.e., the constituent mass is not increasing; the source of the release has been mitigated. [The environmental fate and transport models used to develop the cross-media transfer Appendix I RS assume steady-state concentrations over the AOI.];

(3) NAPL is not present (i.e., If NAPL was present at the site but has been, or will be, removed to the extent practicable, the adsorbed concentrations in soil may be addressed in the MO-2 evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer Appendix I RS assume that NAPL is not present.];

Exception to this criterion: The MO-2 RS may be applied at a soil AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-2 RS).

(4) Soil impacted with volatile constituents is not present beneath an enclosed structure (the release of volatile emissions from soil to an enclosed structure shall be addressed under MO-2 or MO-3); and

(5) High fugitive dust emissions are not present [Examples of conditions that contribute to potentially high fugitive dust emissions include dry soil (moisture content less than 8 percent), finely divided or dusty soils (high silt or clay content), high average annual wind speeds (greater than 5.3 m/s), and less than 50 percent vegetative cover. Examples of activities that may generate high dust levels include heavy truck traffic on unpaved roads or other construction related activities. High fugitive dust emissions shall be addressed under MO-2 or MO-3].

I2.3 Criteria for Impacted Groundwater

(1) The area of impacted soil that is responsible for the impact to a Groundwater 2 or 3 zone is approximately 0.5 acre or less. [The MO-2 DF2 (GW_2) and DF3 (GW_3) are based on an area of impacted soil that is 0.5 acre in size (S_w parameter).]

Exception to this criterion: The Appendix I MO-2 GW_1 may be applied to a Groundwater 1 Zone regardless of the size of the area of impacted soil because a DF is not applied to the GW_1 RS;

(2) A COC(s) is not discharging via groundwater to a surface water body. [The MO-2 Appendix I RS do not address exposure via surface water, sediment, or biota.];

(3) The impacted groundwater is in declining conditions, i.e., the constituent mass is not increasing; the source of the release has been mitigated. [The environmental fate and transport models used to develop the cross-media transfer Appendix I RS assume steady-state concentrations over the AOI.]; and

(4) NAPL is not present (If NAPL was present at the site but has been, or will be, removed to the extent practicable, the dissolved concentrations in groundwater may be addressed in the MO-2 evaluation). [Note: The environmental fate and transport models used to develop the cross-media transfer RS assume that NAPL is not present].

Exception to this criterion: MO-2 may be applied at a groundwater AOC or AOI where NAPL is present, if approved by the Department for the purpose of demonstrating that a CAP (refer to Section 1.2.3) (or current remedial measures) is protective of human health and the environment (i.e., constituent concentrations at or reaching current or potential exposure points or cross-media transfer points are less than or equal to the MO-1 limiting RS).

The Submitter shall demonstrate to the Department that the AOI meets the above criteria to qualify for management under Appendix I and that a site investigation has been conducted in accordance with the guidelines in Appendix B. If an AOI does not meet **all** of these criteria, then LDEQ considers the AOI to be sufficiently complex to warrant a more detailed assessment of risk and the AOI shall be addressed under a more site-specific MO-2 or MO-3 depending on site-specific exposure conditions. Different AOI within a facility may be managed under different Management Options if the areas meet the criteria for management under the Options selected by the Submitter. Exposure pathways and media not addressed by the soil and groundwater MO-2 Appendix I RS shall be addressed under MO-2 or MO-3.

An ecological checklist shall be completed (refer to Appendix C, RECAP Form 18). If the ecological checklist indicates that an ecological assessment is warranted, then an ecological risk assessment shall be required in addition to the MO-2 human health assessment.

I3.0 IDENTIFICATION AND APPLICATION OF APPENDIX I SOIL AND GROUNDWATER RECAP STANDARDS

I3.1 Soil Appendix I RECAP Standards

The Appendix I soil RS include $Soil_i$, $Soil_{ni}$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, and $Soil_{sat}$ and are presented in Tables I-1 - I-16. If the release of volatile emissions from soil (< 15 ft bgs) to an enclosed structure is a pathway of concern at the AOI, include the $Soil_{es}$ RS in Table 2 (or calculate a site-specific $Soil_{es}$ under MO-2, refer to Appendix H) in the identification of the limiting soil RS. For detailed guidance on the application of the $Soil_{es}$ RS, refer to Section H1.1.3.4 of Appendix H. The algorithms and assumptions used to calculate the Appendix I RS are presented in Appendix H. The RfD, SF and chemical-specific values used to calculate the RS are presented in Tables I-17 and I-18. The calculations for the Appendix I RS are presented in spreadsheet format at the end of this Appendix.

Overview:

1. Identify the $Soil_{ni}$ or $Soil_i$, $Soil_{GW}$ (multiply by a DF2 or DF3 if applicable), and $Soil_{sat}$ in the appropriate Appendix I site categorization table;

2. If the soil is present at < 15 ft bgs, contains a volatile COC, and an enclosed structure is present over the AOI, identify the $Soil_{es}$ in Table 2;

3. Identify the lowest of the these values as the limiting soil RS; and

4. Compare the limiting soil RS to the lower of the maximum detected concentration and the 95%UCL-AM concentration.

Detailed guidance on the identification and application of the Appendix I RS is presented in the following sections.

I3.1.1 Identification and Application of the Limiting Appendix I Soil RECAP Standard

(1) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9 of the main document. Categorize the site in accordance with Figure I-1. Identify the appropriate risk-based RS ($Soil_{ni}$ for a non-industrial scenario or $Soil_i$ for an industrial scenario) in the appropriate site categorization table (Tables I-1 - I-16). If more than one constituent is present in soil that elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G.

(2) Identify the appropriate soil concentration protective of groundwater ($Soil_{GW1,}$ $Soil_{GW2,}$ $Soil_{GW3DW}$, or $Soil_{GW3NDW}$) based on the classification of the groundwater to be protected (refer to Section 2.10 of the main document for the Groundwater Classifications). Categorize the site in accordance with Figure I-1. Use the

following guidelines to identify the appropriate $Soil_{GW}$ value to be applied at the area of investigation (AOI):

If the groundwater to be protected meets the criteria for Groundwater Classification 1 ($Soil_{GW1}$):

Identify the $Soil_{GW1}$ presented in the appropriate site categorization table (Tables I-1 - I-16) or develop a site-specific $Soil_{GW1}$ using the guidelines for development of soil protective of groundwater (Method 2 or Method 3) in Appendix H.

If the groundwater to be protected meets the criteria for Groundwater Classification 2 ($Soil_{GW2}$):

(a) Identify the $Soil_{GW2}$ presented in the appropriate site categorization table (Tables I-1 - I-16) (note if the $Soil_{GW2}$ is footnoted with a DF2) or develop a site-specific $Soil_{GW2}$ using the guidelines for development of soil protective of groundwater (Method 2 or Method 3) in Appendix H.

(b) If the $Soil_{GW2}$ value in the appropriate site categorization table (Table I-1 - I-16) is footnoted with DF2 or if a site-specific $Soil_{GW2}$ is developed, identify the longitudinal dilution factor (DF2) to be applied to the $Soil_{GW2}$ from figure I-2 based on: (1) the shortest distance between the point of compliance (POC) and the nearest downgradient property boundary or the nearest downgradient point off-site that could be reasonably considered for the installation of a drinking water well within the aquifer to be protected/restored (POE); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) a DF2 for 2000 feet may be used under MO-2; or (2) a site-specific DF2 may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented in Figure I-2 are not valid and shall not be used. A site-specific DF2 may be developed under MO-3.

(c) If the $Soil_{GW2}$ is footnoted with a DF2 or if a site-specific $Soil_{GW2}$ is developed, multiply the $Soil_{GW2}$ value identified in Step (a) by the longitudinal DF2 identified in Step (a). If the $Soil_{GW2}$ is not footnoted with a DF2, then do not multiply by the DF2. If a $Soil_{GW2}$ (after multiplying by the DF2) is less than a $Soil_{GW1}$, then the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ standard. Note: A DF shall not be applied to the $Soil_{GW1}$ prior to application at the AOI.

If the groundwater to be protected meets the criteria for Groundwater Classification 3 ($Soil_{GW3DW}$ or $Soil_{GW3NDW}$):

(a) Identify the nearest downgradient surface water body (segment or subsegment) that may receive discharge from the groundwater zone to be protected.

(b) Determine if the surface water body (segment or sub-segment) is classified as a drinking water source ($Soil_{GW3DW}$) or a non-drinking water source ($SoilGW_{3NDW}$) (LAC 33:IX Chapter 11) and identify the appropriate $Soil_{GW}$ in the appropriate site categorization table (Tables I-1 - I-16) (note if the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ is footnoted with a DF3) or develop a site-specific $Soil_{GW3}$ using the guidelines for development of soil protective of groundwater (Method 2 or Method 3) in Appendix H.

(c) If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ is footnoted with a DF3 or a site-specific $Soil_{GW3}$ is developed, identify the longitudinal dilution factor (DF3) to be applied to the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ from Figure I-2 based on: (1) the shortest distance between the POC and the nearest downgradient surface water body (POE) identified in Step (a); and (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the POC (source) to the POE is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-2; or (2) a site-specific DF3 may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented in Figure I-2 are not valid and shall not be used. A site-specific DF3 may be developed under MO-3.

(d) If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ is footnoted with a DF3 or a site-specific $Soil_{GW3}$ is developed, multiply the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ obtained in Step (b) by the longitudinal DF3 identified in Step (c). If the $Soil_{3DW}$ or $Soil_{3NDW}$ is not footnoted with a DF3, do not multiply the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ by a DF3.

If the $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ (after applying the DF3) is less than the $Soil_{GW2}$, then the aquifer to be protected shall be managed as a Groundwater 2 aquifer and the $Soil_{GW2}$ shall be identified as the $Soil_{GW}$ standard. Note: A DF2, not a DF3, shall be applied to the $Soil_{GW2}$ prior to application at the AOI. If the $Soil_{GW2}$ (after applying the DF2) is less than the $Soil_{GW1}$, then the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the $Soil_{GW1}$ shall be identified as the $Soil_{GW}$ standard. Note: A DF shall not be applied to the $Soil_{GW1}$ prior to application at the AOI.

Note: In lieu of applying the $Soil_{GW}$ RS to evaluate the soil to groundwater pathway, a leach test may be conducted (refer to Section I3.1.2 and Appendices B and H).

(3) If appropriate, identify the $Soil_{sat}$ in the appropriate site categorization table (Tables I-1 – I-16).

(4) Identify and apply the limiting soil RS as follows:

Surface soil (ground surface to 15 ft bgs):

(a) Compare: (1) the $Soil_{ni}$ or $Soil_i$ identified in Step 1; (2) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, or $Soil_{GW3NDW}$ identified in Step 2; and (3) the $Soil_{sat}$ identified in Step 3; select the lowest of the three values as the limiting surface soil RS;

(b) Determine the AOIC for surface soil in accordance with Section 2.8; **and**

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS, then typically NFA-ATT is warranted for surface soil.

If the AOIC is greater than the limiting RS, then the surface soil shall be further evaluated under MO-2 or MO-3 or remediated to the Appendix I limiting RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs; and (2) 3 ft bgs to 15 ft bgs.

Subsurface soil (>15 ft bgs):

(a) Compare: (1) the $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$ or $Soil_{GW3NDW}$ identified in Step 2; and (2) the $Soil_{sat}$ identified in Step 3; select the lower of the two values as the limiting RS;

(b) Determine the AOIC for suburface soil in accordance with Section 2.8; and

(c) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS, then typically, NFA-ATT is warranted for subsurface soil.

If the AOIC is greater than the limiting RS then the suburface soil shall be further evaluated under MO-2 or MO-3 or remediated to the Appendix I limiting RS.

I3.1.2 Evaluation of Soil Using a Leach Test and Appendix I RECAP Standards ($Soil_{ni}$ or $Soil_i$ and $Soil_{sat}$)

Surface Soil (ground surface to 15 ft bgs):

(1) Compare the leach test results (e.g., SPLP) to the appropriate groundwater standard based on the classification of the groundwater to be protected as follows:

For the protection of groundwater meeting the definition of Groundwater Classification 1:

(a) Identify the GW_1 in the appropriate categorization Table (I-1 - I-16);

(b) Determine the product of GW_1 x 20 (default value for $DF_{Summers}$);

(c) Compare the leach test results to the product of GW_1 x 20:

If the leach test results are less than or equal to the product of GW_1 x 20, then the soil AOIC is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_1 x 20, then the soil AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway or corrective action is required.

For the protection of groundwater meeting the definition of Groundwater Classification 2:

(a) Identify the GW_2 in the appropriate categorization Table (I-1 - I-16);

(b) If the GW_2 is footnoted with a DF2, identify the longitudinal dilution factor (DF2) using Figure I-2 based on: (1) the shortest distance between the POC (source) and the nearest downgradient property boundary or the nearest downgradient point off-site that could be reasonably considered for the installation of a drinking water well within the aquifer to be protected/restored (POE); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) the DF2 for 2000 feet may be used under MO-2; or (2) a site-specific DF2 may be calculated under MO-2 or MO-3. **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented in Figure I-2 are not valid and shall not be used. The Submitter may develop a site-specific DF2 under MO-3;

(c) Determine the product of GW_2 x 20 (default value for $DF_{Summers}$) x DF2;

(d) Compare the leach test results to the product of GW_2 x 20 x DF2:

If the leach test results are less than or equal to the product of GW_2 x 20 x DF2, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the product of GW_2 x 20 x DF2, then the AOIC in the soil may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required or corrective action is required.

For the protection of groundwater meeting the definition of Groundwater Classification 3:

(a) Identify the GW_{3DW} or GW_{3NDW} in the appropriate categorization Table (I-1 - I-16);

(b) If the GW_{3DW} or GW_{3NDW} is footnoted with a DF3, identify the longitudinal dilution factor (DF3) using Figure K-2 based on: (1) the shortest distance between the POC (source) and the nearest downgradient surface water body (POE); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-2; or (2) a site-specific DF3 may be calculated under MO-2 or MO-3. **Note:** If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented in Figure I-2 are not valid and shall not be used. The Submitter may develop a site-specific DF3 under MO-3;

(c) Determine the product of GW_3 x 20 (default value for $DF_{Summers}$) x DF3;

(d) Compare the leach results to the product of GW_3 x 20 x DF3:

If the leach test results are less than or equal to the GW_{3DW} or GW_{3NDW} x 20 x DF3, then the AOIC in the soil is protective of groundwater. Therefore, this pathway is eliminated from further consideration.

If the leach test results are greater than the GW_{3DW} or GW_{3NDW} x $DF_{Summers}$ x DF3, then the soil AOIC may not be protective of groundwater. Further evaluation of the soil to groundwater pathway is required or corrective action is required.

(2) Identify the $Soil_{sat}$ in the appropriate site categorization table (Tables I-1 – I-16).

(3) Identify and apply the limiting RS as follows:

Surface Soil (ground surface to 15 ft bgs):

(a) Determine the appropriate land use scenario (industrial or non-industrial) for current and future land use in accordance with the guidelines presented in Section 2.9 of the main document. Categorize the site in accordance with Figure I-1.

Identify the appropriate risk-based RS ($Soil_{ni}$ for a non-industrial scenario or $Soil_i$ for an industrial scenario) in the appropriate site categorization table (Tables I-1 – I-16). If more than one constituent is present in soil that elicits noncarcinogenic effects on the same target organ/system, modify the $Soil_{ni}$ or $Soil_i$ to account for additivity according to the guidelines presented in Appendix G.

(b) Compare: (1) the $Soil_{ni}$ or $Soil_i$ identified in Step (a); and (2) the $Soil_{sat}$ identified in Step 2; select the lower of the two values as the limiting RS;

(c) Determine the AOIC for surface soil in accordance with Section 2.8; and

(d) Compare the AOIC to the limiting RS:

If the AOIC is less than or equal to the limiting RS for **all** COC, then typically, NFA-ATT of the surface soil is warranted for the direct contact exposure pathways or for the protection of resource aesthetics.

If the AOIC is greater than the limiting soil RS, then the surface soil shall be further evaluated under MO-2 or MO-3 or remediated to the MO-2 Appendix I limiting soil RS.

Note: The Submitter may elect (or the Department may require based on site-specific conditions) to divide the surface soil interval into 2 intervals: (1) ground surface to 3 ft bgs; and (2) 3 ft bgs to depth of impact. An AOIC shall be determined for each interval.

Subsurface soil (>15 ft bgs):

(a) Determine the AOIC for subsurface soil in accordance with Section 2.8;

(b) Compare the AOIC to the $Soil_{sat}$ identified in Step 2:

If the AOIC is less than or equal to the $Soil_{sat}$ for all COC, then typically, NFA-ATT of the subsurface soil is warranted for the protection of resource aesthetics.

If the AOIC is greater than the $Soil_{sat}$, then the subsurface soil shall be further evaluated under MO-2 or MO-3 or remediated to the MO-1 $Soil_{sat}$.

If there is potential for exposure to constituents present in, or released from, soil via pathways not considered in the development of $Soil_i$, $Soil_{ni}$, or $Soil_{GW}$, then these pathways shall be addressed under a more site-specific MO-2 or MO-3. The inhalation of volatiles due to emissions from soil to an enclosed structure and the inhalation of soil particulates may be evaluated under MO-2. A MO-2 evaluation of these pathways may be conducted in conjunction with the Appendix I evaluation.

If the $Soil_{ni}$, $Soil_i$, $Soil_{GW1}$, $Soil_{GW2}$, $Soil_{GW3DW}$, $Soil_{GW3NDW}$, or $Soil_{sat}$ developed under Appendix I was below the analytical quantitation limit, the analytical quantitation limit was presented in the appropriate categorization table (Tables I-1 – I-16) as the RS. An Appendix I Soil RS based on the analytical quantitation limit shall not be multiplied by a DF.

If the limiting soil RS is below a Department-approved (refer to Section 2.13 of the main document) background concentrations, the background concentration shall be identified as the limiting soil RS. An Appendix I Soil RS based on an approved background concentration shall not be multiplied by a DF.

An Appendix I $Soil_{GW}$ shall not result in an unacceptable (> GW_1 or GW_2) constituent concentration in deeper groundwater zones meeting the definition of Groundwater Classifications 1 or 2.

Application of Appendix I soil RS shall not result in soil that exhibits hazardous waste characteristics of ignitability, corrosivity or reactivity as defined in the Hazardous Waste Regulations (LAC 33:V).

If the Department determines that impacted soil is a source medium only (exposure to impacted soil is not likely based on current or future land use and site-specific conditions), then it shall not be required that the risk-based standard for soil ($Soil_{ni}$ or $Soil_i$) be considered in the identification of the limiting RS.

In applying the MO-2 Appendix I limiting RS for the TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in soil shall not exceed 10,000 mg/kg (i.e., the sum of the residual concentrations for the TPH fractions and mixtures shall not exceed 10,000 mg/kg). Refer to Appendix D for further guidance on addressing petroleum hydrocarbon releases.

The procedures used in the development of the soil Appendix I RECAP standards are illustrated in Figures 11 and 14 of the main document.

I3.2 Groundwater Appendix I RECAP Standards

The groundwater RS include GW_1, GW_2, GW_{3DW}, GW_{3NDW}, GW_{air}, and $Water_{sol}$ and are presented in Tables I-1 - I-16. The GW_{air} RS shall be obtained from Table 3 of the main document. If the release of volatile emissions from groundwater (< 15 ft bgs) to an enclosed structure is a pathway of concern at the AOI, include the GW_{es} RS in Table 3 (or calculate a site-specific GW_{es} under MO-2, refer to Appendix H) in the identification of the limiting soil RS. For detailed guidance on the application of the GW_{es} RS, refer to Section H1.2.3.4 of Appendix H. The algorithms and assumptions used to calculate the RS are presented in Appendix H. The RfD, SF and chemical-specific values used to calculate the RS are presented in Tables I-17 and I-18. The calculations for the Appendix I RS are presented in spreadsheet format at the end of this Appendix.

Overview for GW_1:

1. Identify the GW_1 in the appropriate Appendix I site categorization table;
2. If the GW_1 zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;
3. Select the lower of these values as limiting groundwater RS; and
4. Compare the limiting groundwater RS to the CC.

Overview for GW_2:

1. Identify the GW_2 (if applicable, multiply by DF2) and $Water_{sol}$ in the appropriate Appendix I site categorization table;
2. If the GW_2 zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;
3. If the GW_2 zone is present at < 15 ft bgs and an enclosed structure is over the AOI, identify the GW_{es} in Table 3;
4. Select the lowest of these values as limiting groundwater RS; and
5. Compare the limiting groundwater RS to the CC.

Overview for GW_3:

1. Identify the GW_3 (if applicable, multiply by DF3) and $Water_{sol}$ in the appropriate Appendix I site categorization table;
2. If the GW_3 zone is present at < 15 ft bgs and a COC is volatile, identify the GW_{air} in Table 3;
3. If the GW_3 zone is present at < 15 ft bgs and an enclosed structure is over the AOI, calculate a GW_{es} in Table 3;
4. Select the lowest of these values as limiting groundwater RS; and
5. Compare the limiting groundwater RS to the CC.

Detailed guidance on the identification and application of the Appendix I groundwater RS is presented in the following section.

Identification of the limiting Appendix I Groundwater RECAP Standard:

(1) Determine the groundwater classification for the impacted zone using the guidelines presented in Section 2.10 of the main document;

(2) Categorize the site in accordance with Figure I-1;

(3) Identify the appropriate risk-based groundwater RS (GW_1, GW_2, GW_{3DW} and/or GW_{3NDW}) as follows:

If the groundwater to be protected meets the criteria for Groundwater Classification 1:

(a) Identify the GW_1 in the appropriate categorization table (I-1 – I-16). If more than one noncarcinogenic constituent is present in groundwater that elicits effects on the same target organ/system, modify the GW_1 to account for additivity according to the guidelines presented in Appendix G;

(b) If the groundwater zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;

(c) Compare the GW_1 value obtained in Step (a) to: (1) the constituent's water solubility ($Water_{sol}$) (refer to Tables I-1 – I-16); and (2) if applicable, the GW_{air} identified in Step (b); select the lowest of the values as the limiting Appendix I GW_1.

If the groundwater to be protected meets the criteria for Groundwater Classification 2:

(a) Identify the GW_2 in the appropriate categorization table (I-1 – I-16). If more than one noncarcinogenic constituent is present in groundwater that elicits effects on the same target organ/system, modify the GW_2 to account for additivity according to the guidelines presented in Appendix G;

(b) If the GW_2 is footnoted with a DF2, identify the longitudinal dilution factor (DF2) to be applied to the GW_2 using Figure I-2 based on: (1) the shortest distance between the POC (source) and the nearest downgradient property boundary or the nearest downgradient point off-site that could be reasonably considered for the installation of a drinking water well within the aquifer to be protected/restored (POE); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) the DF2 for 2000 feet may be used under MO-2; or (2) a site-specific DF may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF2 values presented in Figure I-2 are not valid and shall not be used. A site-specific DF2 may be developed under MO-3;

(c) If the GW_2 is footnoted with a DF2, multiply the GW_2 value identified in Step (a) by the DF2 identified in Step (b). If the GW_2 is not footnoted with a DF2, do not multiply by a DF2. If the GW_2 (after applying the DF2) is less than the GW_1, then the aquifer to be protected shall be managed as a Groundwater 1 aquifer and the GW_1 shall be identified as the GW RS. Note: A DF shall not be applied to the GW_1 prior to application at the AOI;

(d) If the groundwater zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;

(e) Identify the $Water_{sol}$ (refer to Tables I-1 – I-16); and

(f) Compare: (1) the GW_2 value obtained in Step (c); (2) the GW_{air} identified in Step (d) (if applicable); and (3) the $Water_{sol}$ identified in Step (e); select the lowest of these values as the limiting Appendix I groundwater RS.

If the groundwater to be protected meets the criteria for Groundwater Classification 3:

(a) Identify the nearest downgradient surface water body that may receive discharge from the impacted zone;

(b) Determine if the surface water body (segment or subsegment) to be protected is classified as a drinking water source or a non-drinking water source (LAC 33:IX Chapter 11) and identify the appropriate human health criterion based on the use classification of the surface water body to be protected (GW_{3NDW} for a surface water body classified as a non-drinking water source or the GW_{3DW} for a surface water body classified as a drinking water source) in Tables I-1 – I-16;

(c) If the GW_{3DW} or GW_{3NDW} is footnoted with a DF3, identify the longitudinal dilution factor (DF3) to be applied to the GW_{3NDW} or the GW_{3DW} using Figure I-2 based on: (1) the shortest distance between the POC (source) and the nearest downgradient surface water body (POE) identified in Step (a); (2) source length (the longitudinal distance of impacted soil as measured from the source); and (3) source width. If the distance from the source is greater than 2000 feet, then: (1) the DF3 for 2000 feet may be used under MO-2; or (2) a site-specific DF may be calculated under MO-2 or MO-3. Note: If there is the potential for constituent migration to be influenced by pumping activities within the zone, then the DF3 values presented in Figure I-2 are not valid and shall not be used. A site-specific DF3 may be developed under MO-3.

(d) If the GW_{3DW} or GW_{3NDW} is footnoted with a DF3, multiply the GW_{3NDW} or GW_{3DW} identified in Step (b) by the DF3 identified in Step (c). If the GW_{3DW} or GW_{3NDW} is not footnoted with a DF3, do not multiply the GW_{3NDW} or GW_{3DW} by a DF3. If the GW_3 (after applying the DF3) is less than the GW_2, then the aquifer shall be managed as a Groundwater 2 aquifer and the GW_2 shall be identified as the GW RS. Note: A DF2, not a DF3, shall be applied to the GW_2 prior to application at the AOI. If the GW_2 (after applying the DF2) is less than the GW_1, then the aquifer shall be managed as a Groundwater 1 aquifer and the GW_1 shall be identified as the GW RS. Note: A DF shall not be applied to the GW_1 prior to application at the AOI;

(e) If the groundwater zone is present at < 15 ft bgs, identify the GW_{air} in Table 3;

(f) Identify the $Water_{sol}$ (refer to Tables I-1 – I-16); and

(g) Compare: (1) the GW_3 value obtained in Step (d); (2) the GW_{air} identified in Step (e) (if applicable); and (3) the $Water_{sol}$ identified in Step (f); select the lowest of these values as the limiting Appendix I groundwater RS.

(4) The limiting Appendix I groundwater RS shall be compared to the compliance concentration determined for the impacted groundwater zone at the AOI:

If the compliance concentration in groundwater for the AOI is less than or equal to the limiting groundwater RS, then no corrective action is typically required.

If the compliance concentration exceeds the limiting groundwater RS, then corrective action shall be instituted **or** the AOI shall be evaluated further under MO-3.

If exposure is occurring at a POE for a Groundwater 1 or 2 aquifer:

(1) The limiting Appendix I groundwater RS shall be compared to the compliance concentration determined for the impacted groundwater zone at the AOI:

If the compliance concentration in groundwater for the AOI is less than or equal to the limiting groundwater RS, then no corrective action is typically required;

If the compliance concentration exceeds the limiting groundwater RS, then a corrective action plan shall be submitted under MO-2 or the groundwater AOI shall be evaluated under MO-3; and

(2) The limiting groundwater RS shall be compared to the concentration at the POE (exposure concentration) (Note: A DF shall not be applied to a GW RS applied at the POE):

If the concentration at the POE is less than or equal to the limiting groundwater RS, then typically, no further action shall be required.

If the concentration at the POE exceeds the limiting groundwater RS, then a corrective action plan shall be submitted under MO-2 or the groundwater AOI shall be evaluated under MO-3.

A limiting Appendix I groundwater RS shall not result in an unacceptable constituent concentration in deeper groundwater zones meeting the definition of Groundwater Classifications 1 or 2. If there is concern that a limiting Appendix I GW_3 may result in unacceptable constituent concentrations in a deeper Groundwater 1 or 2 Zone, the potential for constituent migration from the Groundwater 3 Zone to a Groundwater 1 or 2 Zone shall be addressed under MO-3. Criteria for this determination shall include constituent mobility, constituent concentration, vertical distance from Groundwater 3 Zone to a Groundwater 1 or 2 Zone, and probability of public/domestic well installation at or in the vicinity of the AOI.

If there is potential for exposure to constituents present in, or released from, groundwater via pathways not considered in the development of GW_1, GW_2, or GW_3, then these pathways shall be addressed under a more site-specific MO-2 or MO-3.

If the GW_1, GW_2, or GW_3 developed under Appendix I was below the analytical quantitation limit, the analytical quantitation limit was reported as the RS. An Appendix I GW RS based on the analytical quantitation limit shall not be multiplied by a DF.

If the limiting Appendix I GW_1, GW_2 (after applying the DF2), or GW_3 (after applying the DF3), is less than the Department-approved (refer to Section 2.13 of the main document) background concentration, then the background concentration shall be identified as the GW_3 RS. An Appendix I GW RS based on an approved background concentration shall not be multiplied by a DF.

In applying the MO-2 Appendix I limiting RS for the TPH fractions and mixtures, it should be noted that the total concentration of petroleum hydrocarbons in groundwater shall not exceed 10,000 mg/kg (i.e., the sum of the residual concentrations for the TPH fractions and mixtures shall not exceed 10,000 mg/kg). Refer to Appendix D for further guidance on addressing petroleum hydrocarbon releases.

I4.0 USE OF APPENDIX I RECAP STANDARDS

The Appendix I RS (Tables I-1 – I-16) may be used as action standards or corrective action standards. Prior to applying an Appendix I RS at an AOI, it is important to recognize that:

(1) An Appendix I RS is not appropriate as an action standard or corrective action standard for an AOI where exposure pathways other than ingestion of soil, inhalation of volatile emissions released from soil to the ambient air, dermal contact with soil, ingestion of groundwater, inhalation of volatile emissions released from groundwater to indoor air due to the household groundwater use, and inhalation of volatile emissions from groundwater to the ambient air are possible or where media other than soil and groundwater (and air due to volatile emissions from soil or groundwater) are impacted. Soil or groundwater impacted with a volatile COC located beneath an existing or future enclosed structure (building, residence, etc.) may be addressed under Appendix I using the $Soil_{es}$ and GW_{es} RS presented in Table 3. Examples of pathways and media that may be present at an AOI that are not considered in the development of Appendix I soil and groundwater RS include:

  (a) areas of impacted soil with high dust generation such as heavily traveled unpaved roads, uncovered dirt piles, etc. [Appendix I RS have not been developed for exposure due to the inhalation of soil particulates. A MO-2 evaluation of this pathway may be conducted in conjunction with the Appendix I evaluation.]

  (b) impacted surface water, sediment, and/or biota [Appendix I RS have not been developed for exposure via surface water, sediment or biota. Impacted surface water, sediment, and biota shall be addressed under MO-3.]

  Other pathways not listed above, but determined to be present at an AOI, shall be addressed under MO-3.

  An Appendix I RS is not appropriate as an action standard or corrective action standard at an AOI where a receptor may be exposed to both impacted soil **and** groundwater (e.g., a residential receptor exposed to a COC in soil **and** drinking water, i.e., groundwater meeting the definition of Groundwater Classification 1 or 2). The methods used in the development of Appendix I RS are based on exposure to a single medium and may not be adequately protective of receptors exposed to both soil and groundwater. Therefore, the MO-2 Appendix I risk-based RS ($Soil_i$, $Soil_{ni}$, GW_1, and GW_2) shall be adjusted to account for additive health effects associated with exposure to two media in accordance with the guidelines presented in Appendix G.

(2) Appendix I RS are based on the protection of human health and environmental resources - they do not address ecological risks. Further site evaluation may be required if the ecological checklist (Appendix C, RECAP Form 18) indicates the AOI may pose a risk to ecological receptors. An ecological checklist shall be included in the Appendix I submittal.

I4.1 Use of Appendix I Soil and Groundwater RECAP Standards to Screen an AOI or to Support a NFA-ATT Decision

The Appendix I RS may be used as an action standard to: (1) screen an AOI (i.e., identify areas, media, constituents, and/or pathways which warrant further evaluation under MO-2 or MO-3); or (2) support a NFA-ATT decision (i.e., document that the soil AOIC and/or groundwater CC are less than or equal to a constituent concentration that is protective of human health and the environment). The Appendix I RS shall be compared to the soil AOIC and groundwater CC as defined in Section 2.8. If the AOIC and CC for all COC present in soil and groundwater are less than or equal to the Appendix I RS, then typically no further action is required. Requests to the Department for a NFA-ATT determination under Appendix I shall demonstrate that: (1) the AOI meets the criteria for management under Appendix I; (2) current site conditions meet the RS set forth under Appendix I without the use of removal, decontamination, or control measures; and (3) the Appendix I RS have been modified to account for additive health effects due to exposure to multiple constituents which elicit the same critical effect or the affect the same target organ/system and/or exposure to more than one impacted medium by the same receptor. If the soil AOIC or groundwater CC for a COC exceeds the Appendix I RS, the Submitter shall: (1) conduct a more site-specific evaluation under MO-2 or MO-3, or (2) use the Appendix I RS to define the extent of corrective action required at the AOI for the protection of human health and the environment. If the soil AOIC or groundwater CC for a COC is less than or equal to the Appendix I limiting RS, then the COC does not require further assessment at this time for that medium (i.e., the COC is screened out under Appendix I). If the AOIC or CC is less than the Appendix I RS for all COC, then that medium does not require further assessment at this time (i.e., the medium is screened out under MO-2).

I4.2 Application of Appendix I MO-2 RS as Corrective Action Standards

If a soil AOIC or groundwater CC (as defined in Section 2.8 of the main document) exceeds the Appendix I limiting RS (as identified in accordance with guidelines in Section I3.0), and the Submitter does not wish to conduct a more site-specific evaluation under MO-2 or MO-3, then the AOI shall be remediated to the Appendix I RS (refer to Section 2.18).

I5.0 APPENDIX I SUBMITTAL REQUIREMENTS

An Appendix I Submittal Report shall be submitted to the Department for approval for sites evaluated using Appendix I. This report shall, at a minimum, meet the submittal requirements listed below. Any variance from these requirements is subject to Department approval prior to submission of the MO-2 report:

(1) RECAP Form 1 Submittal Summary;
(2) RECAP Form 2 Analytical Data Summary;
(3) RECAP Form 3 Analytical Data Evaluation;
(4) RECAP Form 4 Sampling Information Summary;
(5) RECAP Form 5 Groundwater Monitoring Well Characteristics (if applicable);
(6) RECAP Form 6 Groundwater Monitoring Well Sampling Event Summary (if applicable);
(7) RECAP Form 7 Site-Specific Environmental Fate and Transport Data Summary;
(8) RECAP Form 8 Chemical-Specific Data Summary (if applicable);
(9) RECAP Form 13 Management Option 2 Summary for Soil 0-15 ft bgs (if applicable);
(10) RECAP Form 14 Management Option 2 Summary for Soil > 15 ft bgs (if applicable);
(11) RECAP Form 17 Management Option 2 Summary for Groundwater (if applicable);
(12) RECAP Form 18 Ecological Checklist;
(13) A summary of the results of the SO evaluation and/or the results of the MO-1 evaluation (if applicable);
(14) Site ranking and justification for the ranking;
(15) Topographic map with AOI labeled and name of quadrangle*;
(16) Vicinity map with adjoining properties, cross streets and land use*;
(17) Site map with all significant features*;
(18) Identification of the AOI for each impacted medium and a detailed site map with all sampling locations*;
(19) A description of the site including site history, setting, size, geology, and hydrogeology;
(20) A description of land use at and in the vicinity of the AOI;
(21) A description of groundwater use at and in the vicinity (1-mile radius) of the AOI including a DOTD well survey obtained within the last 12 months;
(22) The groundwater classifications of the zones under evaluation and information used to arrive at this determination; identification of the POC and the POE;
(23) Identification of all known underground utilities (≤ 15 feet bgs) within or adjacent to the AOI;
(24) Documentation that the soil and/or groundwater meets the criteria for management under MO-2 Appendix I;
(25) Identification of the AOIC for each COC in soil (including all calculations and identification of the sampling locations used in the calculations);
(26) Documentation of the methods used to identify the limiting MO-2 Appendix I RS; identification of the critical effects/target organs for each noncarcinogenic COC

and demonstration of the modifications of RS to account for additive effects (including calculations);

(27) A conceptual site model (refer to Section 2.7);

(28) Identification of areas/media where action has been taken (if applicable);

(29) Identification of the AOI and COC for further assessment or for remediation under MO-2 (if applicable); and

(30) Notification of landowners, lessees, and servitude holders (if applicable, refer to Section 2.20).

*Note: All maps must have a bar scale, legend, north arrow, contour intervals (if contoured), date data was obtained, and map date. All maps, figures, diagrams, and cross sections submitted must be legible and unless otherwise approved by the Department, not larger than 11 inches by 17 inches and must be folded to a standard report format (8.5 inches by 11 inches).

TABLE I17
CANCER SLOPE FACTORS AND REFERENCE DOSES

COMPOUND	CAS #	SF_o	REF	SF_i	REF	RfD_o	REF	RfD_i	REF	ABS
		$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$		mg/kg-day		mg/kg-day		unitless
Acenaphthene	83-32-9	*******		*******		6.00E-02	I	6.00E-02	*	0
Acenaphthylene	208-96-8	*******		*******		6.00E-02	S	6.00E-02	*	0
Anthracene	120-12-7	*******		*******		3.00E-01	I	3.00E-01	*	0
Benzene	71-43-2	2.90E-02	I	2.90E-02	I	4.00E-03	I	8.60E-03	I	0
Benz(a)anthracene	56-55-3	7.30E-01	E	3.10E-01	E	*******		*******		0.13
Benzo(a)pyrene	50-32-8	7.30E+00	I	3.10E+00	E	*******		*******		0.13
Benzo(b)fluoranthene	205-99-2	7.30E-01	E	3.10E-01	E	*******		*******		0.13
Benzo(k)fluoranthene	207-08-9	7.30E-02	E	3.10E-02	E	*******		*******		0.13
Chrysene	218-01-9	7.30E-03	E	3.10E-03	E	*******		*******		0.13
Dibenz(a,h)anthracene	53-70-3	7.30E+00	E	3.10E+00	E	*******		*******		0.13
Ethyl benzene	100-41-4	*******		*******		1.00E-01	I	2.86E-01	I	0
Fluoranthene	206-44-0	*******		*******		4.00E-02	I	4.00E-02	*	0.13
Fluorene	86-73-7	*******		*******		4.00E-02	I	4.00E-02	*	0
Indeno(1,2,3-cd)pyrene	193-39-5	7.30E-01	E	3.10E-01	E	*******		*******		0.13
Lead (inorganic)	7439-92-1	*******		*******		*******		*******		IEUBK
Methyl ethyl ketone	78-93-3	*******		*******		6.00E-01	I	2.86E-01	I	0
Methyl isobutyl ketone	108-10-1	*******		*******		8.00E-02	H	8.60E-01	I	0
Methylnaphthalene,2-	91-57-6	*******		*******		2.00E-02	S	8.60E-04	S	0
MTBE (methyl tert-butyl ether)	1634-04-4	*******		*******		8.57E-01	#	8.57E-01	I	0
Naphthalene	91-20-3	*******		*******		2.00E-02	I	8.60E-04	I	0
Phenanthrene	85-01-8	*******		*******		3.00E-01	S	3.00E-01	*	0
Pyrene	129-00-0	*******		*******		3.00E-02	I	3.00E-02	*	0
Toluene	108-88-3	*******		*******		2.00E-01	I	1.14E-01	I	0
Xylene(mixed)	1330-20-7	*******		*******		2.00E-01	I	2.90E-02	I	0
Aliphatics C6-C8	NA	*******		*******		5.00E+00	T	5.30E+00	T	0
Aliphatics >C8-C10	NA	*******		*******		1.00E-01	T	2.90E-01	T	0
Aliphatics >C10-C12	NA	*******		*******		1.00E-01	T	3.00E-01	T	0
Aliphatics >C12-C16	NA	*******		*******		1.00E-01	T	3.00E-01	T	0
Aliphatics >C16-C35	NA	*******		*******		2.00E+00	T	2.00E+00	*	0.1

NOTE: See end of table for designation of letters and symbols.

TABLE I17
CANCER SLOPE FACTORS AND REFERENCE DOSES

COMPOUND	CAS #	SF_o	REF	SF_i	REF	RfD_o	REF	RfD_i	REF	ABS
		$(mg/kg\text{-}day)^{-1}$		$(mg/kg\text{-}day)^{-1}$		mg/kg-day		mg/kg-day		unitless
Aromatics >C8-C10	NA	*******		*******		4.00E-02	T	6.00E-02	T	0
Aromatics >C10-C12	NA	*******		*******		4.00E-02	T	6.00E-02	T	0
Aromatics >C12-C16	NA	*******		*******		4.00E-02	T	6.00E-02	T	0
Aromatics >C16-C21	NA	*******		*******		3.00E-02	T	3.00E-02	*	0.1
Aromatics >C21-C35	NA	*******		*******		3.00E-02	T	3.00E-02	*	0.1

I = Integrated Risk Information System (IRIS), EPA.
H = Health Effects Assessment Summary Tables (HEAST), EPA.
A = Health Effects Assessment Summary Tables Alternative, EPA Region III Risk-Based Concentration Table.
E = EPA-NCEA Regional Support provisional value, EPA Region III Risk-Based Concentration Table.
* = Inhalation toxicity not available, oral toxicity value used to assess inhalation exposure.
# = Oral toxicity value not available, inhalation toxicity value used to assess oral exposure.
O = EPA Region III Risk-Based Concentration Table.
W = Withdrawn from IRIS or HEAST.
T = TPH Criteria Working Group, 1997.
IEUBK = refer to IEUBK model guidelines.
D= Dermal RfD for cadmium is 2.5E-05 mg/kg-d (based on an oral absorption efficiency of 5%; RAGS-E, EPA 1999).

NOTE: See end of table for designation of letters and symbols.

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TABLE I18
CHEMICAL AND PHYSICAL PARAMETERS

COMPOUND	CAS #	MOL. WT	Koc	REF	H	REF	Da	REF	Dw	REF	S	REF
		g/g-mole	cm3/g		atm-m3/mol		cm2/s		cm2/s		mg/L	
Acenaphthene	83-32-9	154.2	4.90E+03	1	1.55E-04	1	4.21E-02	1	7.69E-06	1	4.24E+00	1
Acenaphthylene	208-96-8	152.2	2.00E+03	2	1.14E-04	2	4.39E-02	3	7.53E-06	3	1.60E+01	2
Anthracene	120-12-7	178.23	2.35E+04	1	6.50E-05	1	3.24E-02	1	7.74E-06	1	4.30E-02	1
Benzene	71-43-2	78.11	6.17E+01	1	5.55E-03	1	8.80E-02	1	9.80E-06	1	1.75E+03	1
Benz(a)anthracene	56-55-3	228.29	3.58E+05	1	3.35E-06	1	5.10E-02	1	9.00E-06	1	9.40E-03	1
Benzo(a)pyrene	50-32-8	252.32	9.69E+05	1	1.13E-06	1	4.30E-02	1	9.00E-06	1	1.60E-03	1
Benzo(b)fluoranthene	205-99-2	252.32	1.23E+06	1	1.11E-04	1	2.26E-02	1	5.56E-06	1	1.50E-03	1
Benzo(k)fluoranthene	207-08-9	252.32	1.23E+06	1	8.29E-07	1	2.26E-02	1	5.56E-06	1	8.00E-04	1
Chrysene	218-01-9	228.29	3.98E+05	1	9.46E-05	1	2.48E-02	1	6.21E-06	1	1.60E-03	1
Dibenz(a,h)anthracene	53-70-3	278.35	1.79E+06	1	1.47E-08	1	2.02E-02	1	5.18E-06	1	2.50E-03	1
Ethyl benzene	100-41-4	106.17	2.04E+02	1	7.88E-03	1	7.50E-02	1	7.80E-06	1	1.69E+02	1
Fluoranthene	206-44-0	202.26	4.91E+04	1	1.61E-05	1	3.02E-02	1	6.35E-06	1	2.06E-01	1
Fluorene	86-73-7	166.22	7.71E+03	1	6.36E-05	1	3.63E-02	1	7.88E-06	1	1.98E+00	1
Indeno(1,2,3-cd)pyrene	193-39-5	276.34	3.47E+06	1	1.60E-06	1	1.90E-02	1	5.66E-06	1	2.20E-05	1
Lead (inorganic)	7439-92-1	207.2	********	********	********	********	********	********	********	********	********	********
Methyl ethyl ketone	78-93-3	72.11	1.23E+00	4	5.60E-05	2	8.08E-02	E	9.80E-06	E	2.20E+05	2
Methyl isobutyl ketone	108-10-1	100.16	6.20E+00	4	1.40E-04	2	7.50E-02	3	7.80E-06	3	1.90E+04	2
Methylnaphthalene,2-	91-57-6	142.2	2.24E+03	3	5.80E-05	3	4.80E-02	3	7.84E-06	3	2.46E+01	2
MTBE (methyl tert-butyl ether)	1634-04-4	83.1	1.12E+01	6	5.87E-04	6	1.02E-01	3	1.05E-05	3	5.10E+04	6
Naphthalene	91-20-3	128.17	1.19E+03	1	4.83E-04	1	5.90E-02	1	7.50E-06	1	3.10E+01	1
Phenanthrene	85-01-8	178.24	4.80E+03	2	2.33E-05	2	3.24E-02	E	7.74E-06	E	1.15E+00	2
Pyrene	129-00-0	202.26	6.80E+04	1	1.10E-05	1	2.72E-02	1	7.24E-06	1	1.35E-01	1
Toluene	108-88-3	92.14	1.40E+02	1	6.64E-03	1	8.70E-02	1	8.60E-06	1	5.26E+02	1
Xylene(mixed)	1330-20-7	106.17	1.29E+02	4	7.60E-03	1	7.00E-02	1	7.80E-06	1	1.60E+02	1
Aliphatics C6-C8	NA	100	3.98E+03	10	1.22E+00	10	1.00E-01	10	1.00E-05	10	********	********
Aliphatics >C8-C10	NA	130	3.16E+04	10	1.95E+00	10	1.00E-01	10	1.00E-05	10	********	********
Aliphatics >C10-C12	NA	160	2.51E+05	10	2.93E+00	10	1.00E-01	10	1.00E-05	10	********	********
Aliphatics >C12-C16	NA	200	5.01E+06	10	1.27E+01	10	1.00E-01	10	1.00E-05	10	********	********
Aliphatics >C16-C35	NA	270	6.31E+08	10	1.20E+02	10	1.00E-01	10	1.00E-05	10	********	********

NOTE: See end of table for designation of numbers and letter.

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TABLE I18
CHEMICAL AND PHYSICAL PARAMETERS

COMPOUND	CAS #	MOL. WT	Koc	REF	H	REF	Da	REF	Dw	REF	S	REF
		g/g-mole	cm3/g		atm-m3/mol		cm2/s		cm2/s		mg/L	
Aromatics >C8-C10	NA	120	1.58E+03	10	1.17E-02	10	1.00E-01	10	1.00E-05	10	********	********
Aromatics >C10-C12	NA	130	2.51E+03	10	3.41E-03	10	1.00E-01	10	1.00E-05	10	********	********
Aromatics >C12-C16	NA	150	5.01E+03	10	1.29E-03	10	1.00E-01	10	1.00E-05	10	********	********
Aromatics >C16-C21	NA	190	1.58E+04	10	3.17E-04	10	1.00E-01	10	1.00E-05	10	********	********
Aromatics >C21-C35	NA	240	1.26E+05	10	1.63E-05	10	1.00E-01	10	1.00E-05	10	********	********

* If data on more than one isomer is available then used most protective. If data available on only one isomer than used that data.
1. Soil Screening Guidance, 1996.
2. Superfund Chemical Data Matrix, June 1996.
3. Air Emissions Models for Waste and Wastewater, EPA-453/R-94-080A, 1994.
4. Groundwater Chemicals Desk Reference, Montgomery, J. H., et.al., 1990.
5. Groundwater Chemicals Desk Reference, vol. II, Montgomery, J. H., et.al., 1991.
6. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, vol. IV, 1991.
7. Handbook of Environmental Fate and Exposure Data for Organic Chemicals, vol. II, 1991.
8. Soil Chemistry of Hazardous Materials, 1988.
9. CHEMDAT 8, November, 1994.
10. Total Petroleum Hydrocarbon Criteria Workgroup, 1996.
E - Estimated.

LDEQ RECAP
APPENDIX I
QUANTITATION LIMITS USED IN RECAP

COMPOUND	**Soil**	**GW**
	mg/kg	**mg/l**
Acenaphthene		1.0E-02
Acenaphthylene		
Anthracene		1.0E-02
Benzene		
Benz(a)anthracene		7.8E-03
Benzo(a)pyrene	3.3E-01	
Benzo(b)fluoranthene		4.8E-03
Benzo(k)fluoranthene		2.5E-03
Chrysene		1.5E-03
Dibenz(a,h)anthracene	3.3E-01	2.5E-03
Ethyl benzene		
Fluoranthene		1.0E-02
Fluorene		1.0E-02
Indeno(1,2,3-cd)pyrene		3.7E-03
Lead (inorganic)		
Methyl ethyl ketone		1.0E-01
Methyl isobutyl ketone		5.0E-02
Methylnaphthalene,2-		
MTBE (methyl tert-butyl ether)		5.0E-04
Naphthalene		1.0E-02
Phenanthrene		
Pyrene		1.0E-02
Toluene		
Xylene(mixed)		
Aliphatics C6-C8		1.5E-01
Aliphatics >C8-C10		1.5E-01
Aliphatics >C10-C12		1.5E-01
Aliphatics >C12-C16		1.5E-01
Aliphatics >C16-C35		1.5E-01
Aromatics >C8-C10		1.5E-01
Aromatics >C10-C12		1.5E-01
Aromatics >C12-C16		1.5E-01
Aromatics >C16-C21		1.5E-01
Aromatics >C21-C35		1.5E-01

Soil properties		Management Option 2							
Revision Date: 08/04/2003									
Run date:	10/16/2003								
*****calculation inputs*****									
1.7	g/cm3		pb = dry soil bulk density						
0.358491	Lpore/Lsoil		n = total soil porosity						
0.21	Lwater/Lsoil		nw = water-filled soil porosity						
0.148491	Lair/Lsoil		na = air-filled soil porosity						
2.65	g/cm3		ps = soil particle density						
0.006	g/g		foc = fractional organic carbon in soil						
148	(ft) = L = length of the source at the water table								
148	(ft) = W = width of impacted area perpendicular to flow direction of aquifer								
0.5	Acres		AOI site area - input into Q/C equation below						
76.30616	g/m2-s per kg/m3		Q/C = inverse of mean concentration at center of square source						
Q/C Table									
site size	148*148	209*209	295*295	467*467	660*660	1143*1143			
site size	0.5 acre	1 acre	2 acre	5 acre	10 acre	30 acre			
Q/C value	76.3062	67.4304	59.872	51.4648	46.1707	39.2329			

LDEQ RECAP
WORKSHEET I7
SUMMER'S DAF

Sd eqn & Summer's Model DAF	
Revision Date: 08/04/2003	
Run date:	10/16/2003
Sd = hadv + hdisp = thickness of the mixing zone	
15.6	(ft)
hadv = B*[1 - exp((-I*L)/(B*Dv))]	
0.81	(ft) = hadv = advective component of the plume depth
0.33	(ft/ft) = I = infiltration rate
60.00	(ft/yr) = Dv = horizontal Darcy velocity
20.00	(ft) = B = thickness of the shallow water bearing zone
148.00	(ft) = L = length of the source at the water table
hdisp = (2*Az*L)	
14.80	(ft) = hdisp = dispersive component of the plume depth
0.74	(ft) = Az = vertical dispersivity
148.00	(ft) = L = length of the source at the water table
Summer's Model DAF	
DAF = Cl/Cgw = (Qa+Qp)/Qp	
20.0	unitless
Qa = Dv*Sd*W	
138577	(ft3/yr) = Qa = volumetric flow rate of groundwater
60.00	(ft/yr) = Dv = horizontal Darcy velocity
15.61	(ft) = Sd = hadv + hdisp = thickness of the mixing zone
148.00	(ft) = W = width of impacted area perpendicular to flow direction of aquifer
Qp = I*A	
7301.33	(ft3/yr) = Qp = volumetric flow rate of infiltration (soil pore water) into the aquifer
0.33	(ft/yr) = I = infiltration rate
21904.00	(ft2) = A = area of the source
Max DF Domenico	#NAME?
(for use with SoilGW and GW values)	

Domenico Analytical Solute Transport Model	**Appendix I**
Revision Date: 08/04/2003	
Run date:	10/16/2003
General assumptions:	
1.	A single continuous source of one chemical compound dissolved in the groundwater. No NAPL.
2.	No initial groundwater contamination.
3.	Chemical compound is non-reactive.
4.	No biodegradation or retardation occuring.
5.	Groundwater flow is in one direction.
6.	Saturated zone is homogeneous and isotropic
7.	Contaminant plume is a planar source spreading infinitely laterally in two directions and vertically in one direction.
8.	The point "X" is behind the point where "X = v * time since spill"
9.	Longitudinal, transverse, and vertical groundwater dispersivities are based on ASTM E 1739-95 example.
10.	The DAF is based on the estimated contaminant concentration (Cxi) at the center line of the plume.
Example Calculation of the Groundwater Dilution Attenuation Factor	
Site-specific inputs:	
2000	(ft) = X = distance downgradient from source.
15.6	(ft) = Sd = vertical depth of plume (measured vertical extent of affected groundwater plume or the full thickness of the groundwater stratum). Based on site size.
148	(ft) = Sw = groundwater plume width perpendicular to groundwater flow. (See Soil properties page to input.)
Defaults:	
60	(ft/yr) = Dv = K * i = Darcy groundwater velocity.
0.36	(dimensionless) = O = soil porosity.
166.66667	(ft/yr) = Dv / O = v = linear Darcy groundwater transport velocity.
200	(ft) = X * 0.1 = Ax = longitudinal groundwater dispersivity.
66.666667	(ft) = Ax / 3 = Ay = transverse groundwater dispersivity.
10	(ft) = Ax / 20 = Az = vertical groundwater dispersivity.
1	(dimensionless) = Ri = retardation factor for constituent i.
0	(yr-1) = Yi = first-order degradation constant for constituent i.
Model equation:	
(Csi/Cxi)= DAF =	1/((EXP((X/(2*Ax))*(1-(SQRT(1+(4*Yi*Ax*Ri/v)))))) *(ERF(Sw/(4*(SQRT(Ay*X)))))*(ERF(Sd/(2*(SQRT(Az*X))))))
=	#NAME? (dimensionless)

LDEQ RECAP
WORKSHEET I8
DOMENICO DAF

				Appendix I - DAF				
X (ft) = distance				(dimensionless)				
downgradient from		Sw or L=	30 ft	65 ft	100 ft	148 ft		
source =		Sd =	3.2 ft	6.9 ft	10.5 ft	15.6 ft		
0 - 50			2.8	1.2	1.0	1.0		
50 - 100			9.1	2.5	1.5	1.1		
100 - 150			20	4.7	2.4	1.5		
150 - 250			53	12	5.5	2.9		
250 - 500			212	46	20	9.4		
500 - 750			476	102	44	20		
750 - 1000			846	182	78	36		
1000 - 1250			1321	283	121	56		
1250 - 1500			1902	408	174	80		
1500 - 1750			2588	555	237	108		
1750 - 2000			3380	724	310	141		

LDEQ RECAP
WORKSHEET I1
GW 1 AND 2
(mg/l)

Appendix I **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/16/2003

C(mg/l)-Vol GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

COMPOUND	**MCL (mg/l)**	**C(mg/l)-V**	**C(mg/l)-NV**	**N(mg/l)-V**	**N(mg/l)-NV**	**MCL or min value (C or N)**	**GW1 (mg/l)**		**GW2 (mg/l)**		**FOR CAL SOILGW1**	**FOR CAL SOILGW2**
Acenaphthene		NA		3.65E-01		3.7E-01	3.7E-01	N	3.7E-01	X DF 2	3.7E-01	3.7E-01
Acenaphthylene		NA		3.65E-01		3.7E-01	3.7E-01	N	3.7E-01	X DF 2	3.7E-01	3.7E-01
Anthracene		NA		1.83E+00		1.8E+00	1.8E+00	N	1.8E+00	X DF 2	4.3E-02	4.3E-02
Benzene	5.00E-03	3.81E-04		4.39E-02		5.0E-03	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	5.0E-03
Benz(a)anthracene			9.09E-05		NA	9.1E-05	7.8E-03	Q	#NAME?	######	7.8E-03	#NAME?
Benzo(a)pyrene	2.00E-04		9.09E-06		NA	2.0E-04	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	2.0E-04
Benzo(b)fluoranthene			9.09E-05		NA	9.1E-05	4.8E-03	Q	#NAME?	######	1.5E-03	#NAME?
Benzo(k)fluoranthene			9.09E-04		NA	9.1E-04	2.5E-03	Q	#NAME?	######	8.0E-04	#NAME?
Chrysene			9.09E-03		NA	9.1E-03	9.1E-03	C	9.1E-03	X DF 2	1.6E-03	1.6E-03
Dibenz(a,h)anthracene			9.09E-06		NA	9.1E-06	2.5E-03	Q	#NAME?	######	2.5E-03	#NAME?
Ethyl benzene	7.00E-01	NA		1.33E+00		7.0E-01	7.0E-01	MCL	7.0E-01	X DF 2	7.0E-01	7.0E-01
Fluoranthene			NA		1.46E+00	1.5E+00	1.5E+00	N	1.5E+00	X DF 2	2.1E-01	2.1E-01
Fluorene		NA		2.43E-01		2.4E-01	2.4E-01	N	2.4E-01	X DF 2	2.4E-01	2.4E-01
Indeno(1,2,3-cd)pyrene			9.09E-05		NA	9.1E-05	3.7E-03	Q	#NAME?	######	2.2E-05	#NAME?
Lead (inorganic)	1.50E-02		NA		NA	1.5E-02	1.5E-02	MCL	1.5E-02	X DF 2	1.5E-02	1.5E-02
Methyl ethyl ketone		NA		1.91E+00		1.9E+00	1.9E+00	N	1.9E+00	X DF 2	1.9E+00	1.9E+00
Methyl isobutyl ketone		NA		1.99E+00		2.0E+00	2.0E+00	N	2.0E+00	X DF 2	2.0E+00	2.0E+00
Methylnaphthalene,2-		NA		6.22E-03		6.2E-03	6.2E-03	N	6.2E-03	X DF 2	6.2E-03	6.2E-03
MTBE (methyl tert-butyl ether)	2.00E-02	NA		5.21E+00		2.0E-02	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	2.0E-02
Naphthalene		NA		6.22E-03		6.2E-03	1.0E-02	Q	#NAME?	######	1.0E-02	#NAME?
Phenanthrene		NA		1.83E+00		1.8E+00	1.8E+00	N	1.8E+00	X DF 2	1.2E+00	1.2E+00
Pyrene		NA		1.83E-01		1.8E-01	1.8E-01	N	1.8E-01	X DF 2	1.4E-01	1.4E-01
Toluene	1.00E+00	NA		7.47E-01		1.0E+00	1.0E+00	MCL	1.0E+00	X DF 2	1.0E+00	1.0E+00
Xylene(mixed)	1.00E+01	NA		2.06E-01		1.0E+01	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	1.0E+01

LDEQ RECAP
WORKSHEET I1
GW 1 AND 2
(mg/l)

Appendix I **Groundwater Classification 1 & 2**
Revision Date: 08/04/2003 Run date: 10/16/2003

C(mg/l)-Vol GW1&2 = (TR*ATc*365)/(EFni*((SFi*Kw*IRAadj)+(SFo*IRWadj)))
C(mg/l)-NVol GW1&2 = (TR*ATc*365)/(EFni*(SFo*IRWadj))
N(mg/l)-Vol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(((IRAa/RfDi)*Kw)+(IRWa/RfDo)))
N(mg/l)-NVol GW1&2 = (THQ*BWa*ATnni*365)/(EFni*EDni*(IRWa/RfDo))

COMPOUND	MCL (mg/l)	C(mg/l)-V	C(mg/l)-NV	N(mg/l)-V	N(mg/l)-NV	MCL or min value (C or N)	GW1 (mg/l)		GW2 (mg/l)		FOR CAL SOILGW1	FOR CAL SOILGW2
Aliphatics C6-C8		NA		3.19E+01		3.2E+01	3.2E+01	N	3.2E+01	X DF 2	3.2E+01	3.2E+01
Aliphatics >C8-C10		NA		1.34E+00		1.3E+00	1.3E+00	N	1.3E+00	X DF 2	1.3E+00	1.3E+00
Aliphatics >C10-C12		NA		1.37E+00		1.4E+00	1.4E+00	N	1.4E+00	X DF 2	1.4E+00	1.4E+00
Aliphatics >C12-C16		NA		1.37E+00		1.4E+00	1.4E+00	N	1.4E+00	X DF 2	1.4E+00	1.4E+00
Aliphatics >C16-C35			NA		7.30E+01	7.3E+01	7.3E+01	N	7.3E+01	X DF 2	7.3E+01	7.3E+01
Aromatics >C8-C10		NA		3.37E-01		3.4E-01	3.4E-01	N	3.4E-01	X DF 2	3.4E-01	3.4E-01
Aromatics >C10-C12		NA		3.37E-01		3.4E-01	3.4E-01	N	3.4E-01	X DF 2	3.4E-01	3.4E-01
Aromatics >C12-C16		NA		3.37E-01		3.4E-01	3.4E-01	N	3.4E-01	X DF 2	3.4E-01	3.4E-01
Aromatics >C16-C21			NA		1.10E+00	1.1E+00	1.1E+00	N	1.1E+00	X DF 2	1.1E+00	1.1E+00
Aromatics >C21-C35			NA		1.10E+00	1.1E+00	1.1E+00	N	1.1E+00	X DF 2	1.1E+00	1.1E+00
TPH-GRO (C6-C10)							3.4E-01		3.4E-01			
TPH-DRO (C10-C28)							3.4E-01		3.4E-01			
TPH-ORO (>C28)							1.1E+00		1.1E+00			

T - For MTBE the listed value is the EPA taste/odor advisory value.

LDEQ RECAP
WORKSHEET I2
GW 3NDW
(mg/l)

Appendix I **Groundwater Classification 3-Non-drinking water**
Revision Date: 08/04/2003 Run date: 10/16/2003

C (mg/l) GW3NDW = (TR*BWa) / (SFo*(IRWndw+BCF*IRF))
N (mg/l) GW3NDW = (THQ*RfDo*BWa) / (IRWndw+BCF*IRF)

	LAC 33:IX.	**LAC 33:IX.**					**LAC(NDW) or max**	
	1113(HHNDW)	**1113(HHDW)**	**MCL**	**BCF**			**(LAC,MCL, (MIN C, N))**	
COMPOUND	**(mg/L)**	**(mg/L)**	**(mg/l)**	**(l/kg)**	**C (mg/l)**	**N (mg/l)**	**(mg/l)**	
Acenaphthene				3.87E+02	NA	5.36E-01	5.4E-01	(*2)N
Acenaphthylene				2.69E+02	NA	7.68E-01	7.7E-01	(*2)N
Anthracene				9.20E+03	NA	1.14E-01	1.1E-01	(*2)N
Benzene	1.25E-02	1.10E-03	5.00E-03				1.3E-02	(*1)LAC(NDW)
Benz(a)anthracene				1.26E+04	3.80E-07	NA	3.8E-07	(*2)C
Benzo(a)pyrene			2.00E-04	8.29E+04	5.78E-09	NA	2.0E-04	MCL
Benzo(b)fluoranthene				3.03E+04	1.58E-07	NA	1.6E-07	(*2)C
Benzo(k)fluoranthene				3.03E+04	1.58E-06	NA	1.6E-06	(*2)C
Chrysene				1.26E+04	3.80E-05	NA	3.8E-05	(*2)C
Dibenz(a,h)anthracene				7.28E+04	6.59E-09	NA	6.6E-09	(*2)C
Ethyl benzene	8.10E+00	2.39E+00	7.00E-01				8.1E+00	(*1)LAC(NDW)
Fluoranthene				4.43E+03	NA	3.16E-02	3.2E-02	(*2)N
Fluorene				1.80E+03	NA	7.76E-02	7.8E-02	(*2)N
Indeno(1,2,3-cd)pyrene				7.28E+04	6.59E-08	NA	6.6E-08	(*2)C
Lead (inorganic)		5.00E-02	1.50E-02		NA	NA	5.0E-02	LAC(DW)
Methyl ethyl ketone				9.61E-01	NA	3.88E+02	3.9E+02	(*2)N
Methyl isobutyl ketone				4.81E+00	NA	3.02E+01	3.0E+01	(*2)N
Methylnaphthalene,2-				2.60E+03	NA	2.69E-02	2.7E-02	(*2)N
MTBE (methyl tert-butyl ether)			2.00E-02	1.00E+00	NA	5.50E+02	5.5E+02	(*2)N
Naphthalene				3.10E+02	NA	2.23E-01	2.2E-01	(*2)N
Phenanthrene				5.10E+03	NA	2.06E-01	2.1E-01	(*2)N
Pyrene				6.90E+01	NA	1.43E+00	1.4E+00	(*2)N
Toluene	4.62E+01	6.10E+00	1.00E+00				4.6E+01	(*1)LAC(NDW)
Xylene(mixed)			1.00E+01	1.59E+02	NA	4.28E+00	1.0E+01	MCL
Aliphatics C6-C8				0.00E+00	NA	3.93E+03	3.9E+03	(*2)N
Aliphatics >C8-C10				0.00E+00	NA	7.87E+01	7.9E+01	(*2)N
Aliphatics >C10-C12				0.00E+00	NA	7.87E+01	7.9E+01	(*2)N
Aliphatics >C12-C16				0.00E+00	NA	7.87E+01	7.9E+01	(*2)N

LDEQ RECAP
WORKSHEET I2
GW 3NDW
(mg/l)

Aliphatics >C16-C35				0.00E+00	NA	1.57E+03	1.6E+03	(*2)N
Aromatics >C8-C10				0.00E+00	NA	3.15E+01	3.1E+01	(*2)N
Aromatics >C10-C12				0.00E+00	NA	3.15E+01	3.1E+01	(*2)N
Aromatics >C12-C16				0.00E+00	NA	3.15E+01	3.1E+01	(*2)N
Aromatics >C16-C21				0.00E+00	NA	2.36E+01	2.4E+01	(*2)N
Aromatics >C21-C35				0.00E+00	NA	2.36E+01	2.4E+01	(*2)N
TPH-GRO (C6-C10)							3.1E+01	
TPH-DRO (C10-C28)							2.4E+01	
TPH-ORO (>C28)							2.4E+01	

References: Data hierarchy is based on (*1) then (*2).

(*1) Louisiana Administrative Code 33.IX.1113, Table 1 (HHNDW)

(*2) The maximum value of LAC 33.IX1113 (DW), MCL, or the minimum of
human health non-drinking water criteria calculated in accordance with "Human Health Numerical Criteria
Derivations for Toxic Substances", LDEQ-OWR, June 23, 1994; (N=non-carcinogen, C=carcinogen)

Notes:

* BCF values from the Superfund Chemical Data Matrix, June 1996

* BCF values not found in the Superfund Chemical Data Matrix are estimated below

T - For MTBE the listed value is the EPA taste/odor advisory value.

LDEQ RECAP
WORKSHEET I2
GW 3NDW
(mg/l)

Estimation of BCF from Kow:
log BCF = 0.76 log Kow - 0.23
(from the Handbook of Chemical Property Estimation Methods, Lyman, Reehl, and Rosenblatt,
American Chemical Society, Washington, DC, 1990)

					log Kow	log BCF	BCF	
Acenaphthylene					3.5	2.43	2.69E+02	
Acetone					-2.4E-01	-0.4124	3.87E-01	
Aniline					9.8E-01	0.5148	3.27E+00	
Barium (ionic)							1.00E+00	(1)
Benz(a)anthracene					5.7E+00	4.102	1.26E+04	
Benzo(b)fluoranthene					6.2E+00	4.482	3.03E+04	
Benzo(k)fluoranthene					6.2E+00	4.482	3.03E+04	
Biphenyl, 1,1-					4.0E+00	2.81	6.46E+02	
Bis(2-chloroisopropyl)ether					2.6E+00	1.746	5.57E+01	
Bromomethane					1.2E+00	0.682	4.81E+00	
Carbon disulfide					2.0E+00	1.29	1.95E+01	
Chloroaniline, p-					1.9E+00	1.214	1.64E+01	
Chlorobenzene					2.9E+00	1.974	9.42E+01	
Chloroethane (ethylchloride)					1.4E+00	0.834	6.82E+00	
Chloromethane(Methyl chloride)					9.1E-01	0.4616	2.89E+00	
Chloronaphthalene, 2-					4.1E+00	2.886	7.69E+02	
Chromium (III)							1.00E+00	(1)
Chromium (VI)							1.00E+00	(1)
Chrysene					5.7E+00	4.102	1.26E+04	
Cobalt							1.00E+00	(1)
Dibenz(a,h)anthracene					6.7E+00	4.862	7.28E+04	
Dibenzofuran					4.2E+00	2.962	9.16E+02	
Dibromo-3-chloropropane,1,2-					2.3E+00	1.518	3.30E+01	
Dichloroethane, 1,1-					1.8E+00	1.138	1.37E+01	
Dichloroethene, cis, 1,2-					1.9E+00	1.214	1.64E+01	
Dichloroethene, trans, 1,2-					2.1E+00	1.366	2.32E+01	
Dichloropropane, 1,2-					2.0E+00	1.29	1.95E+01	
Dinitrobenzene, 1,3-					1.5E+00	0.91	8.13E+00	
Dinitrophenol, 2,4-					1.6E+00	0.986	9.68E+00	

LDEQ RECAP
WORKSHEET I2
GW 3NDW
(mg/l)

Dinitrotoluene, 2,6-					1.9E+00	1.214	1.64E+01	
Dinitrotoluene, 2,4-					2.0E+00	1.29	1.95E+01	
Dinoseb					3.1E+00	2.126	1.34E+02	
Fluroanthene					5.1E+00	3.646	4.43E+03	
Hexachlorocyclopentadiene					5.4E+00	3.874	7.48E+03	
Indeno(1,2,3-cd)pyrene					6.7E+00	4.862	7.28E+04	
Isobutyl alcohol					7.5E-01	0.34	2.19E+00	
Methyl ethyl ketone					2.8E-01	-0.0172	9.61E-01	
Methyl isobutyl ketone					1.2E+00	0.682	4.81E+00	
MTBE							1.00E+00	(1)
Nitrate							1.00E+00	(1)
Nitrite							1.00E+00	(1)
Nitroaniline, 2-					1.9E+00	1.214	1.64E+01	
Nitroaniline, 3-					1.4E+00	0.834	6.82E+00	
Nitroaniline, 4-					1.4E+00	0.834	6.82E+00	
Nitrobenzene					1.8E+00	1.138	1.37E+01	
Nitrophenol, 4-					1.9E+00	1.214	1.64E+01	
Nitrosodi-n-propylamine, n-					1.4E+00	0.834	6.82E+00	
Phenol					1.5E+00	0.91	8.13E+00	
Styrene					2.9E+00	1.974	9.42E+01	
Tetrachlorobenzene,1,2,4,5-					4.6E+00	3.266	1.85E+03	
Tetrachloroethane,1,1,1,2-					2.6E+00	1.746	5.57E+01	
Trichlorofluoromethane					2.5E+00	1.67	4.68E+01	
Trichlorophenol, 2,4,5-					3.9E+00	2.734	5.42E+02	
Trichlorophenol, 2,4,6-					3.7E+00	2.582	3.82E+02	
Vanadium							1.00E+00	(1)
Xylene (mixed)					3.2E+00	2.202	1.59E+02	
Aliphatics C6-C8							0.00E+00	(2)
Aliphatics >C8-C10							0.00E+00	(2)
Aliphatics >C10-C12							0.00E+00	(2)
Aliphatics >C12-C16							0.00E+00	(2)
Aliphatics >C16-C35							0.00E+00	(2)

Aromatics >C8-C10							0.00E+00	(2)
Aromatics >C10-C12							0.00E+00	(2)
Aromatics >C12-C16							0.00E+00	(2)
Aromatics >C16-C21							0.00E+00	(2)
Aromatics >C21-C35							0.00E+00	(2)

Notes:

log Kow values from the Superfund Data Matrix, June 1996

(1) Data on this chemical could not be found. Therefore, assume BCF = 1

Xylene (mixed) Kow is the highest value of m,o,p xylene Kow values.

(2) Research has shown that this chemical does not bioconcentrate.

Estimation of Kow from Koc:

log Koc = 0.0784 + (0.7919 * log Kow)

(p 141 Soil Screening Guidance: Technical Background Document, May 1996)

LDEQ RECAP
WORKSHEET I3
GW 3DW
(mg/l)

Appendix I **Groundwater Classification 3-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/16/2003

C (mg/l) GW3DW = (TR*BWa) / (SFo*(IRWa+IRWndw+BCF*IRF))
N (mg/l) GW3DW = (THQ*RfDo*BWa) / (IRWa+IRWndw+BCF*IRF)

	LAC 33:IX.					**LAC, MCL or**	
	1113(HHDW)	**MCL**	**BCF**			**min (C,N)**	
COMPOUND	**(mg/L)**	**(mg/l)**	**(l/kg)**	**C (mg/l)**	**N (mg/l)**	**(mg/l)**	
Acenaphthene			3.87E+02	NA	4.27E-01	4.3E-01	(*3)N
Acenaphthylene			2.69E+02	NA	5.62E-01	5.6E-01	(*3)N
Anthracene			9.20E+03	NA	1.13E-01	1.1E-01	(*3)N
Benzene	1.10E-03	5.00E-03				1.1E-03	(*1)LAC
Benz(a)anthracene			1.26E+04	3.77E-07	NA	3.8E-07	(*3)C
Benzo(a)pyrene		2.00E-04				2.0E-04	(*2)MCL
Benzo(b)fluoranthene			3.03E+04	1.58E-07	NA	1.6E-07	(*3)C
Benzo(k)fluoranthene			3.03E+04	1.58E-06	NA	1.6E-06	(*3)C
Chrysene			1.26E+04	3.77E-05	NA	3.8E-05	(*3)C
Dibenz(a,h)anthracene			7.28E+04	6.58E-09	NA	6.6E-09	(*3)C
Ethyl benzene	2.39E+00	7.00E-01				2.4E+00	(*1)LAC
Fluoranthene			4.43E+03	NA	3.09E-02	3.1E-02	(*3)N
Fluorene			1.80E+03	NA	7.35E-02	7.4E-02	(*3)N
Indeno(1,2,3-cd)pyrene			7.28E+04	6.58E-08	NA	6.6E-08	(*3)C
Lead (inorganic)	5.00E-02	1.50E-02				5.0E-02	(*1)LAC
Methyl ethyl ketone			9.61E-01	NA	1.99E+01	2.0E+01	(*3)N
Methyl isobutyl ketone			4.81E+00	NA	2.56E+00	2.6E+00	(*3)N
Methylnaphthalene,2-			2.60E+03	NA	2.59E-02	2.6E-02	(*3)N
MTBE (methyl tert-butyl ether)		2.00E-02		NA	2.87E+01	2.0E-02	(*2)T
Naphthalene			3.10E+02	NA	1.69E-01	1.7E-01	(*3)N
Phenanthrene			5.10E+03	NA	2.02E-01	2.0E-01	(*3)N
Pyrene			6.90E+01	NA	6.05E-01	6.1E-01	(*3)N
Toluene	6.10E+00	1.00E+00				6.1E+00	(*1)LAC
Xylene(mixed)		1.00E+01				1.0E+01	(*2)MCL
Aliphatics C6-C8			0.00E+00	NA	1.68E+02	1.7E+02	(*3)N
Aliphatics >C8-C10			0.00E+00	NA	3.35E+00	3.4E+00	(*3)N

LDEQ RECAP
WORKSHEET I3
GW 3DW
(mg/l)

Appendix I **Groundwater Classification 3-Drinking Water**
Revision Date: 08/04/2003 Run date: 10/16/2003

C (mg/l) GW3DW = (TR*BWa) / (SFo*(IRWa+IRWndw+BCF*IRF))
N (mg/l) GW3DW = (THQ*RfDo*BWa) / (IRWa+IRWndw+BCF*IRF)

COMPOUND	LAC 33:IX. 1113(HHDW) (mg/L)	MCL (mg/l)	BCF (l/kg)	C (mg/l)	N (mg/l)	LAC, MCL or min (C,N) (mg/l)	
Aliphatics >C10-C12			0.00E+00	NA	3.35E+00	3.4E+00	(*3)N
Aliphatics >C12-C16			0.00E+00	NA	3.35E+00	3.4E+00	(*3)N
Aliphatics >C16-C35			0.00E+00	NA	6.70E+01	6.7E+01	(*3)N
Aromatics >C8-C10			0.00E+00	NA	1.34E+00	1.3E+00	(*3)N
Aromatics >C10-C12			0.00E+00	NA	1.34E+00	1.3E+00	(*3)N
Aromatics >C12-C16			0.00E+00	NA	1.34E+00	1.3E+00	(*3)N
Aromatics >C16-C21			0.00E+00	NA	1.01E+00	1.0E+00	(*3)N
Aromatics >C21-C35			0.00E+00	NA	1.01E+00	1.0E+00	(*3)N
TPH-GRO (C6-C10)						1.3E+00	
TPH-DRO (C10-C28)						1.0E+00	
TPH-ORO (>C28)						1.0E+00	

References: Data hierarchy is based on (*1), (*2), and then (*3).
(*1) Louisiana Administrative Code 33.IX.1113, Table 1
Metals criteria are hardness-dependent. Listed criteria assume a hardness value of 50 mg/L.
Site specific criteria may be calculated using the natural logarithm formulas at LAC 33:IX.1113, Table 1.
Drinking water supply is a raw water source which may require treatment before use. Defined at LAC 33:IX.1105.
(*2) EPA's Maximum Contaminant Level (MCL) for drinking water
(*3) Human health public water water supply criteria calculated in accordance with "Human Health Numerical Criteria Derivations for Toxic Substances", LDEQ-OWR, June 23, 1994; (N=non-carcinogen, C=carcinogen)
T - For MTBE the listed value is the EPA taste/odor advisory value.

LDEQ RECAP
WORKSHEET I4
SOILni
(mg/kg)

Appendix I **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/16/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

	DA	**VFnic**	**VFnia**	**Soilni**	**Soilni**	**Soilni**	**Soilni**	**min value**	**Soilni**	
COMPOUND	**(cm2/s)**	**(m3/kg)**	**(m3/kg)**	**C-O (mg/kg)**	**C-I (mg/kg)**	**N-O (mg/kg)**	**N-I (mg/kg)**	**(C or N)**	**(mg/kg)**	
Acenaphthene	7.85E-08	1.95E+05	NA	NA		3.74E+03		3.7E+03	3.7E+03	N
Acenaphthylene	1.50E-07	1.41E+05	NA	NA		3.47E+03		3.5E+03	3.5E+03	N
Anthracene	6.24E-09	6.93E+05	NA	NA		2.19E+04		2.2E+04	2.2E+04	N
Benzene	3.10E-04	3.11E+03	6.96E+03	1.49E+00		3.69E+01		1.5E+00	1.5E+00	C
Benz(a)anthracene	1.31E-10	NA	1.07E+07	6.20E-01		NA		6.2E-01	6.2E-01	C
Benzo(a)pyrene	4.17E-11	NA	1.90E+07	6.21E-02		NA		6.2E-02	3.3E-01	Q
Benzo(b)fluoranthene	1.30E-10	NA	1.08E+07	6.20E-01		NA		6.2E-01	6.2E-01	C
Benzo(k)fluoranthene	1.98E-11	NA	2.75E+07	6.21E+00		NA		6.2E+00	6.2E+00	C
Chrysene	3.85E-10	NA	6.25E+06	6.19E+01		NA		6.2E+01	6.2E+01	C
Dibenz(a,h)anthracene	1.22E-11	NA	3.51E+07	6.21E-02		NA		6.2E-02	3.3E-01	Q
Ethyl benzene	1.40E-04	4.63E+03	NA	NA		1.64E+03		1.6E+03	1.6E+03	N
Fluoranthene	1.08E-09	1.67E+06	NA	NA		2.24E+03		2.2E+03	2.2E+03	N
Fluorene	2.05E-08	3.82E+05	NA	NA		2.77E+03		2.8E+03	2.8E+03	N
Indeno(1,2,3-cd)pyrene	7.32E-12	NA	4.53E+07	6.21E-01		NA		6.2E-01	6.2E-01	C
Lead (inorganic)	NA	NA	NA	NA	NA	NA	NA	NA	0.0E+00	
Methyl ethyl ketone	1.31E-05	1.51E+04	NA	NA		5.91E+03		5.9E+03	5.9E+03	N
Methyl isobutyl ketone	2.24E-05	1.16E+04	NA	NA		4.46E+03		4.5E+03	4.5E+03	N
Methylnaphthalene,2-	8.13E-08	1.92E+05	NA	NA		2.22E+02		2.2E+02	2.2E+02	N
MTBE (methyl tert-butyl ether)	1.02E-04	5.41E+03	NA	NA		6.54E+03		6.5E+03	6.5E+03	N
Naphthalene	1.30E-06	4.80E+04	NA	NA		6.20E+01		6.2E+01	6.2E+01	N
Phenanthrene	1.52E-08	4.43E+05	NA	NA		2.11E+04		2.1E+04	2.1E+04	N

LDEQ RECAP
WORKSHEET I4
SOILni
(mg/kg)

Appendix I **Soil-Nonindustrial**
Revision Date: 08/04/2003 Run date: 10/16/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFnic = (Q\C*1e-4*(3.14*DA*Tnic)^0.5)/(2*pb*DA)
VFnia = (Q\C*1e-4*(3.14*DA*Tnia)^0.5)/(2*pb*DA)

Soilni-C-O = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFi*(IRAadj/VFnia)+SFo*1e-6*ABS*IRDadj))
Soilni-C-I = (TR*ATc*365)/(EFni*(SFo*1e-6*IRSadj+SFo*1e-6*ABS*IRDadj))
Soilni-N-O = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(IRAc/RfDi)*(1/VFnic)+(SAc/RfDo)*AFc*ABS*1e-6))
Soilni-N-I = (THQ*BWc*ATnc*365)/(EFni*EDc*((IRSc/RfDo)*1e-6+(SAc/RfDo)*AFc*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFnic (m3/kg)	VFnia (m3/kg)	Soilni C-O (mg/kg)	Soilni C-I (mg/kg)	Soilni N-O (mg/kg)	Soilni N-I (mg/kg)	min value (C or N)	Soilni (mg/kg)	
Pyrene	6.85E-10	2.09E+06	NA	NA		2.29E+03		2.3E+03	2.3E+03	N
Toluene	1.91E-04	3.96E+03	NA	NA		6.76E+02		6.8E+02	6.8E+02	N
Xylene(mixed)	1.87E-04	4.00E+03	NA	NA		1.79E+02		1.8E+02	1.8E+02	N
Aliphatics C6-C8	1.40E-03	1.46E+03	NA	NA		1.18E+04		1.2E+04	1.0E+04	O,T
Aliphatics >C8-C10	3.22E-04	3.05E+03	NA	NA		1.18E+03		1.2E+03	1.2E+03	N
Aliphatics >C10-C12	6.28E-05	6.90E+03	NA	NA		2.29E+03		2.3E+03	2.3E+03	N
Aliphatics >C12-C16	1.37E-05	1.48E+04	NA	NA		3.68E+03		3.7E+03	3.7E+03	N
Aliphatics >C16-C35	1.03E-06	5.40E+04	NA	NA		7.09E+04		7.1E+04	1.0E+04	O,T
Aromatics >C8-C10	3.94E-05	8.72E+03	NA	NA		6.49E+02		6.5E+02	6.5E+02	N
Aromatics >C10-C12	7.31E-06	2.02E+04	NA	NA		1.18E+03		1.2E+03	1.2E+03	N
Aromatics >C12-C16	1.40E-06	4.63E+04	NA	NA		1.82E+03		1.8E+03	1.8E+03	N
Aromatics >C16-C21	1.11E-07	1.64E+05	NA	NA		1.48E+03		1.5E+03	1.5E+03	N
Aromatics >C21-C35	1.04E-09	1.70E+06	NA	NA		1.79E+03		1.8E+03	1.8E+03	N
TPH-GRO (C6-C10)								6.5E+02	6.5E+02	
TPH-DRO (C10-C28)								6.5E+02	6.5E+02	
TPH-ORO (>C28)								1.8E+03	1.8E+03	

LDEQ RECAP
WORKSHEET I5
SOILi
(mg/kg)

Appendix I **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/16/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFi (m3/kg)	Soili C-O (mg/kg)	Soili C-I (mg/kg)	Soili N-O (mg/kg)	Soili N-I (mg/kg)	min value (C or N)	Soili (mg/kg)	
Acenaphthene	7.85E-08	3.99E+05	NA		6.12E+04		6.1E+04	6.1E+04	N
Acenaphthylene	1.50E-07	2.89E+05	NA		5.14E+04		5.1E+04	5.1E+04	N
Anthracene	6.24E-09	1.42E+06	NA		4.78E+05		4.8E+05	4.8E+05	N
Benzene	3.10E-04	6.35E+03	3.08E+00		2.70E+02		3.1E+00	3.1E+00	C
Benz(a)anthracene	1.31E-10	9.75E+06	2.87E+00		NA		2.9E+00	2.9E+00	C
Benzo(a)pyrene	4.17E-11	1.73E+07	2.88E-01		NA		2.9E-01	3.3E-01	Q
Benzo(b)fluoranthene	1.30E-10	9.82E+06	2.87E+00		NA		2.9E+00	2.9E+00	C
Benzo(k)fluoranthene	1.98E-11	2.51E+07	2.88E+01		NA		2.9E+01	2.9E+01	C
Chrysene	3.85E-10	5.70E+06	2.86E+02		NA		2.9E+02	2.9E+02	C
Dibenz(a,h)anthracene	1.22E-11	3.21E+07	2.88E-01		NA		2.9E-01	3.3E-01	Q
Ethyl benzene	1.40E-04	9.45E+03	NA		1.29E+04		1.3E+04	1.3E+04	N
Fluoranthene	1.08E-09	3.40E+06	NA		2.89E+04		2.9E+04	2.9E+04	N
Fluorene	2.05E-08	7.81E+05	NA		5.41E+04		5.4E+04	5.4E+04	N
Indeno(1,2,3-cd)pyrene	7.32E-12	4.13E+07	2.88E+00		NA		2.9E+00	2.9E+00	C
Lead (inorganic)	NA	NA	NA	NA	NA	NA	NA	0.0E+00	
Methyl ethyl ketone	1.31E-05	3.09E+04	NA		4.35E+04		4.4E+04	4.4E+04	N
Methyl isobutyl ketone	2.24E-05	2.36E+04	NA		6.35E+04		6.3E+04	6.3E+04	N
Methylnaphthalene,2-	8.13E-08	3.92E+05	NA		1.65E+03		1.7E+03	1.7E+03	N
MTBE (methyl tert-butyl ether)	1.02E-04	1.10E+04	NA		4.71E+04		4.7E+04	4.7E+04	N
Naphthalene	1.30E-06	9.80E+04	NA		4.26E+02		4.3E+02	4.3E+02	N
Phenanthrene	1.52E-08	9.06E+05	NA		4.25E+05		4.3E+05	4.3E+05	N
Pyrene	6.85E-10	4.27E+06	NA		5.61E+04		5.6E+04	5.6E+04	N

LDEQ RECAP
WORKSHEET I5
SOILi
(mg/kg)

Appendix I **Soil-Industrial**
Revision Date: 08/04/2003 Run date: 10/16/2003

DA = ((na^(10/3)*Da*H*41+nw^(10/3)*Dw)/n^2)/(pb*Koc*foc+nw+na*H*41)
VFi = (Q\C*1e-4*(3.14*DA*Ti)^0.5)/(2*pb*DA)

Soili-C-O = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFi*(IRAa/VFi)+SFo*SAai*AFai*ABS*1e-6))
Soili-C-I = (TR*BWa*ATc*365)/(EFi*EDi*(SFo*1e-6*IRSi+SFo*SAai*AFai*ABS*1e-6))
Soili-N-O = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(IRAa/RfDi)*(1/VFi)+(SAai/RfDo)*AFai*ABS*1e-6))
Soili-N-I = (THQ*BWa*ATni*365)/(EFi*EDi*((IRSi/RfDo)*1e-6+(SAai/RfDo)*AFai*ABS*1e-6)))

COMPOUND	DA (cm2/s)	VFi (m3/kg)	Soili C-O (mg/kg)	Soili C-I (mg/kg)	Soili N-O (mg/kg)	Soili N-I (mg/kg)	min value (C or N)	Soili (mg/kg)	
Toluene	1.91E-04	8.10E+03	NA		4.66E+03		4.7E+03	4.7E+03	N
Xylene(mixed)	1.87E-04	8.17E+03	NA		1.21E+03		1.2E+03	1.2E+03	N
Aliphatics C6-C8	1.40E-03	2.99E+03	NA		8.03E+04		8.0E+04	1.0E+04	O,T
Aliphatics >C8-C10	3.22E-04	6.23E+03	NA		8.83E+03		8.8E+03	8.8E+03	N
Aliphatics >C10-C12	6.28E-05	1.41E+04	NA		1.96E+04		2.0E+04	1.0E+04	O,T
Aliphatics >C12-C16	1.37E-05	3.02E+04	NA		3.77E+04		3.8E+04	1.0E+04	O,T
Aliphatics >C16-C35	1.03E-06	1.10E+05	NA		6.87E+05		6.9E+05	1.0E+04	O,T
Aromatics >C8-C10	3.94E-05	1.78E+04	NA		5.12E+03		5.1E+03	5.1E+03	N
Aromatics >C10-C12	7.31E-06	4.13E+04	NA		1.10E+04		1.1E+04	1.0E+04	O,T
Aromatics >C12-C16	1.40E-06	9.45E+04	NA		2.14E+04		2.1E+04	1.0E+04	O,T
Aromatics >C16-C21	1.11E-07	3.36E+05	NA		1.75E+04		1.7E+04	1.0E+04	O,T
Aromatics >C21-C35	1.04E-09	3.47E+06	NA		2.52E+04		2.5E+04	1.0E+04	O,T
TPH-GRO (C6-C10)							5.1E+03	5.1E+03	
TPH-DRO (C10-C28)							5.1E+03	5.1E+03	
TPH-ORO (>C28)							2.5E+04	1.0E+04	

LDEQ RECAP
WORKSHEET I6
SOILGW and SOILsat
(mg/kg)

Appendix I — **SoilGW & Soilsat**

Revision Date: 08/04/2003 — Run date: 10/16/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	**SoilGW1 (mg/kg)**	**SoilGW2 (mg/kg)**	**SoilGW3DW (mg/kg)**	**SoilGW3NDW (mg/kg)**	**Soilsat (mg/kg)**
Acenaphthene	2.2E+02	2.2E+02	#NAME?	#NAME?	NA
Acenaphthylene	8.8E+01	8.8E+01	#NAME?	#NAME?	NA
Anthracene	1.2E+02	1.2E+02	#NAME?	#NAME?	NA
Benzene	5.1E-02	5.1E-02	#NAME?	#NAME?	9.0E+02
Benz(a)anthracene	3.3E+02	#NAME?	#NAME?	#NAME?	NA
Benzo(a)pyrene	2.3E+01	2.3E+01	#NAME?	#NAME?	NA
Benzo(b)fluoranthene	2.2E+02	#NAME?	#NAME?	#NAME?	NA
Benzo(k)fluoranthene	1.2E+02	#NAME?	#NAME?	#NAME?	NA
Chrysene	7.6E+01	7.6E+01	#NAME?	#NAME?	NA
Dibenz(a,h)anthracene	5.4E+02	#NAME?	#NAME?	#NAME?	NA
Ethyl benzene	1.9E+01	1.9E+01	#NAME?	#NAME?	2.3E+02
Fluoranthene	1.2E+03	1.2E+03	#NAME?	#NAME?	NA
Fluorene	2.3E+02	2.3E+02	#NAME?	#NAME?	NA
Indeno(1,2,3-cd)pyrene	9.2E+00	#NAME?	#NAME?	#NAME?	NA
Lead (inorganic)	NA	NA	NA	NA	NA
Methyl ethyl ketone	5.0E+00	5.0E+00	#NAME?	#NAME?	2.9E+04
Methyl isobutyl ketone	6.4E+00	6.4E+00	#NAME?	#NAME?	3.1E+03
Methylnaphthalene,2-	1.7E+00	1.7E+00	#NAME?	#NAME?	NA
MTBE (methyl tert-butyl ether)	7.7E-02	7.7E-02	#NAME?	#NAME?	9.8E+03
Naphthalene	1.5E+00	#NAME?	#NAME?	#NAME?	NA
Phenanthrene	6.6E+02	6.6E+02	#NAME?	#NAME?	NA
Pyrene	1.1E+03	1.1E+03	#NAME?	#NAME?	NA
Toluene	2.0E+01	2.0E+01	#NAME?	#NAME?	5.2E+02

LDEQ RECAP
WORKSHEET I6
SOILGW and SOILsat
(mg/kg)

Appendix I | **SoilGW & Soilsat**
Revision Date: 08/04/2003 | Run date: 10/16/2003

SoilGW1 = DFsummers*(GW1*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW2 = DFsummers*(GW2*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3NDW =DFsummers* (GW3NDW*(pb*Koc*foc+nw+na*H*41))/(pb)
SoilGW3DW =DFsummers* (GW3DW*(pb*Koc*foc+nw+na*H*41))/(pb)

Soilsat = S*(Koc*foc*pb+nw+H*41*na)/pb

COMPOUND	**SoilGW1 (mg/kg)**	**SoilGW2 (mg/kg)**	**SoilGW3DW (mg/kg)**	**SoilGW3NDW (mg/kg)**	**Soilsat (mg/kg)**
Xylene(mixed)	1.8E+02	1.8E+02	#NAME?	#NAME?	1.5E+02
Aliphatics C6-C8	1.8E+04	1.8E+04	#NAME?	#NAME?	NA
Aliphatics >C8-C10	5.3E+03	5.3E+03	#NAME?	#NAME?	NA
Aliphatics >C10-C12	4.2E+04	4.2E+04	#NAME?	#NAME?	NA
Aliphatics >C12-C16	8.2E+05	8.2E+05	#NAME?	#NAME?	NA
Aliphatics >C16-C35	5.5E+09	5.5E+09	#NAME?	#NAME?	NA
Aromatics >C8-C10	6.5E+01	6.5E+01	#NAME?	#NAME?	NA
Aromatics >C10-C12	1.0E+02	1.0E+02	#NAME?	#NAME?	NA
Aromatics >C12-C16	2.0E+02	2.0E+02	#NAME?	#NAME?	NA
Aromatics >C16-C21	2.1E+03	2.1E+03	#NAME?	#NAME?	NA
Aromatics >C21-C35	1.7E+04	1.7E+04	#NAME?	#NAME?	NA
TPH-GRO (C6-C10)	6.5E+01	6.5E+01	#NAME?	#NAME?	
TPH-DRO (C10-C28)	6.5E+01	6.5E+01	#NAME?	#NAME?	
TPH-ORO (>C28)	1.7E+04	1.7E+04	#NAME?	#NAME?	

LDEQ RECAP
APPENDIX I
CATEGORY 4
STANDARDS FOR SOIL
(mg/kg)
Source Length = 30 feet
foc = 0.006

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.1E+03	N	8.0E+04	N	2.2E+02	A	2.2E+02	X DF 2	2.5E+02	X DF3	3.2E+02	X DF 3	NA
Acenaphthylene	208-96-8	3.9E+03	N	7.1E+04	N	8.8E+01	A	8.8E+01	X DF 2	1.4E+02	X DF3	1.9E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.3E+05	N	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Benzene	71-43-2	2.6E+00	C	5.7E+00	C	5.1E-02	A	5.1E-02	X DF 2	1.1E-02	X DF3	1.3E-01	X DF 3	9.0E+02
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	8.6E+00	A	3.9E+00	X DF 2	1.6E-02	X DF3	1.6E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	2.3E+01	A	2.3E+01	X DF 2	2.3E+01	X DF3	2.3E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	2.2E+02	A	1.3E+01	X DF 2	2.3E-02	X DF3	2.3E-02	X DF 3	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	1.2E+02	A	1.2E+02	X DF 2	2.3E-01	X DF3	2.3E-01	X DF 3	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	7.6E+01	A	7.6E+01	X DF 2	1.8E+00	X DF3	1.8E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	5.4E+02	A	2.0E+00	X DF 2	1.4E-03	X DF3	1.4E-03	X DF 3	NA
Ethyl benzene	100-41-4	2.6E+03	N	2.3E+04	N	1.9E+01	A	1.9E+01	X DF 2	6.6E+01	X DF3	2.2E+02	X DF 3	2.3E+02
Fluoranthene	206-44-0	2.3E+03	N	2.9E+04	N	1.2E+03	A	1.2E+03	X DF 2	1.8E+02	X DF3	1.9E+02	X DF 3	NA
Fluorene	86-73-7	2.9E+03	N	6.4E+04	N	2.3E+02	A	2.3E+02	X DF 2	6.8E+01	X DF3	7.2E+01	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	9.2E+00	A	9.2E+00	X DF 2	2.7E-02	X DF3	2.7E-02	X DF 3	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	1.0E+04	N	7.9E+04	N	5.0E+00	A	5.0E+00	X DF 2	5.2E+01	X DF3	1.0E+03	X DF 3	2.9E+04
Methyl isobutyl ketone	108-10-1	5.2E+03	N	8.9E+04	N	6.4E+00	A	6.4E+00	X DF 2	8.3E+00	X DF3	9.7E+01	X DF 3	3.1E+03
Methylnaphthalene,2-	91-57-6	3.7E+02	N	3.0E+03	N	1.7E+00	A	1.7E+00	X DF 2	7.0E+00	X DF3	7.3E+00	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	1.1E+04	N	8.6E+04	N	7.7E-02	A	7.7E-02	X DF 2	7.7E-02	X DF3	2.1E+03	X DF 3	9.8E+03
Naphthalene	91-20-3	1.1E+02	N	7.9E+02	N	1.5E+00	A	9.0E-01	X DF 2	2.5E+01	X DF3	3.2E+01	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	5.0E+05	N	6.7E+02	A	6.7E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.8E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.1E+03	X DF3	1.1E+03	X DF 3	NA
Toluene	108-88-3	1.2E+03	N	8.7E+03	N	2.0E+01	A	2.0E+01	X DF 2	1.2E+02	X DF3	5.2E+02	SS	5.2E+02
Xylene(mixed)	1330-20-7	3.3E+02	N	2.3E+03	N	1.5E+02	SS	1.5E+02	SS	1.5E+02	SS	1.5E+02	SS	1.5E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	2.0E+03	N	1.0E+04	O,T	5.3E+03	A	5.3E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	3.4E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	4.9E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.0E+03	N	9.1E+03	N	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF3	NA
Aromatics >C10-C12	NA	1.7E+03	N	1.0E+04	O,T	1.0E+02	A	1.0E+02	X DF2	4.1E+02	X DF3	9.6E+03	X DF3	NA
Aromatics >C12-C16	NA	2.3E+03	N	1.0E+04	O,T	2.0E+02	A	2.0E+02	X DF2	8.1E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.6E+03	N	1.0E+04	O,T	2.1E+03	A	2.1E+03	X DF2	1.9E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.0E+03	N,I	9.1E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF 3	NA
TPH-DRO	NA	1.0E+03	N,I	9.1E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF 3	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 4
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 30 feet
foc = 0.006

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	1.6E-07	X DF 3	1.6E-07	X DF 3	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	1.6E-06	X DF 3	1.6E-06	X DF 3	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	6.6E-09	X DF 3	6.6E-09	X DF 3	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	6.6E-08	X DF 3	6.6E-08	X DF 3	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	4.3E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 8
STANDARDS FOR SOIL
(mg/kg)
Source Length = 30 feet
foc = 0.01

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.2E+03	N	8.7E+04	N	3.6E+02	A	3.6E+02	X DF 2	4.2E+02	X DF3	5.3E+02	X DF 3	NA
Acenaphthylene	208-96-8	4.1E+03	N	7.8E+04	N	1.5E+02	A	1.5E+02	X DF 2	2.3E+02	X DF3	3.1E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.5E+05	N	2.0E+02	A	2.0E+02	X DF 2	2.0E+02	X DF3	2.0E+02	X DF 3	NA
Benzene	71-43-2	3.1E+00	C	6.9E+00	C	7.6E-02	A	7.6E-02	X DF 2	1.7E-02	X DF3	1.9E-01	X DF 3	1.3E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	5.6E+02	A	6.5E+00	X DF 2	2.7E-02	X DF3	2.7E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	3.9E+01	A	3.9E+01	X DF 2	3.9E+01	X DF3	3.9E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	3.7E+02	A	2.2E+01	X DF 2	3.9E-02	X DF3	3.9E-02	X DF 3	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	2.0E+02	A	2.0E+02	X DF 2	3.9E-01	X DF3	3.9E-01	X DF 3	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	1.3E+02	A	1.3E+02	X DF 2	3.0E+00	X DF3	3.0E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	8.9E+02	A	3.3E+00	X DF 2	2.4E-03	X DF3	2.4E-03	X DF 3	NA
Ethyl benzene	100-41-4	3.0E+03	N	2.8E+04	N	3.1E+01	A	3.1E+01	X DF 2	1.0E+02	X DF3	3.5E+02	X DF 3	3.7E+02
Fluoranthene	206-44-0	2.3E+03	N	3.0E+04	N	2.0E+03	A	2.0E+03	X DF 2	3.0E+02	X DF3	3.1E+02	X DF 3	NA
Fluorene	86-73-7	3.0E+03	N	6.8E+04	N	3.8E+02	A	3.8E+02	X DF 2	1.1E+02	X DF3	1.2E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	1.5E+01	A	1.5E+01	X DF 2	4.6E-02	X DF3	4.6E-02	X DF 3	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	1.0E+04	N	8.1E+04	N	5.2E+00	A	5.2E+00	X DF 2	5.4E+01	X DF3	1.1E+03	X DF 3	3.0E+04
Methyl isobutyl ketone	108-10-1	5.2E+03	N	9.2E+04	N	7.4E+00	A	7.4E+00	X DF 2	9.5E+00	X DF3	1.1E+02	X DF 3	3.5E+03
Methylnaphthalene,2-	91-57-6	4.5E+02	N	3.8E+03	N	2.8E+00	A	2.8E+00	X DF 2	1.2E+01	X DF3	1.2E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	1.2E+04	N	9.6E+04	N	9.5E-02	A	9.5E-02	X DF 2	9.5E-02	X DF3	2.6E+03	X DF 3	1.2E+04
Naphthalene	91-20-3	1.4E+02	N	1.0E+03	N	2.4E+00	A	1.5E+00	X DF 2	4.1E+01	X DF3	5.4E+01	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	5.2E+05	N	1.1E+03	A	1.1E+03	X DF 2	1.9E+02	X DF3	2.0E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.9E+04	N	1.8E+03	A	1.8E+03	X DF 2	1.8E+03	X DF3	1.8E+03	X DF 3	NA
Toluene	108-88-3	1.5E+03	N	1.1E+04	N	3.1E+01	A	3.1E+01	X DF 2	1.9E+02	X DF3	8.1E+02	SS	8.1E+02
Xylene(mixed)	1330-20-7	4.1E+02	N	2.8E+03	N	2.3E+02	SS	2.3E+02	SS	2.3E+02	SS	2.3E+02	SS	2.3E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	2.3E+03	N	1.0E+04	O,T	8.7E+03	A	8.7E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	3.9E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	5.3E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.2E+03	N	1.0E+04	O,T	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.9E+03	N	1.0E+04	O,T	1.7E+02	A	1.7E+02	X DF2	6.8E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.4E+03	N	1.0E+04	O,T	3.4E+02	A	3.4E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.7E+03	N	1.0E+04	O,T	3.5E+03	A	3.5E+03	X DF2	3.2E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.2E+03	N,I	1.0E+04	O,T	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.2E+03	N,I	1.0E+04	O,T	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 8
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 30 feet
foc = 0.01

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	1.6E-07	X DF 3	1.6E-07	X DF 3	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	1.6E-06	X DF 3	1.6E-06	X DF 3	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	6.6E-09	X DF 3	6.6E-09	X DF 3	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	6.6E-08	X DF 3	6.6E-08	X DF 3	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 12
STANDARDS FOR SOIL
(mg/kg)
Source Length = 30 feet
foc = 0.02

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.4E+03	N	9.5E+04	N	7.2E+02	A	7.2E+02	X DF 2	8.4E+02	X DF3	1.1E+03	X DF 3	NA
Acenaphthylene	208-96-8	4.3E+03	N	8.7E+04	N	2.9E+02	A	2.9E+02	X DF 2	4.5E+02	X DF3	6.2E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.7E+05	N	4.0E+02	A	4.0E+02	X DF 2	4.0E+02	X DF3	4.0E+02	X DF 3	NA
Benzene	71-43-2	4.0E+00	C	9.2E+00	C	1.4E-01	A	1.4E-01	X DF 2	3.0E-02	X DF3	3.4E-01	X DF 3	2.4E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	1.1E+03	A	1.3E+01	X DF 2	5.4E-02	X DF3	5.4E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	7.8E+01	A	7.8E+01	X DF 2	7.8E+01	X DF3	7.8E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	7.4E+02	A	4.5E+01	X DF 2	7.8E-02	X DF3	7.8E-02	X DF 3	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	3.9E+02	A	3.9E+02	X DF 2	7.8E-01	X DF3	7.8E-01	X DF 3	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	2.5E+02	A	2.5E+02	X DF 2	6.0E+00	X DF3	6.1E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	1.8E+03	A	6.5E+00	X DF 2	4.7E-03	X DF3	4.7E-03	X DF 3	NA
Ethyl benzene	100-41-4	3.6E+03	N	3.7E+04	N	5.9E+01	A	5.9E+01	X DF 2	2.0E+02	X DF3	6.9E+02	X DF 3	7.2E+02
Fluoranthene	206-44-0	2.3E+03	N	3.0E+04	N	4.0E+03	A	4.0E+03	X DF 2	6.1E+02	X DF3	6.2E+02	X DF 3	NA
Fluorene	86-73-7	3.0E+03	N	7.1E+04	N	7.5E+02	A	7.5E+02	X DF 2	2.3E+02	X DF3	2.4E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	3.1E+01	A	3.1E+01	X DF 2	9.1E-02	X DF3	9.1E-02	X DF 3	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	1.1E+04	N	8.4E+04	N	5.7E+00	A	5.7E+00	X DF 2	5.9E+01	X DF3	1.2E+03	X DF 3	3.3E+04
Methyl isobutyl ketone	108-10-1	5.3E+03	N	9.8E+04	N	9.9E+00	A	9.9E+00	X DF 2	1.3E+01	X DF3	1.5E+02	X DF 3	4.7E+03
Methylnaphthalene,2-	91-57-6	5.6E+02	N	5.2E+03	N	5.6E+00	A	5.6E+00	X DF 2	2.3E+01	X DF3	2.4E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	1.4E+04	N	1.1E+05	N	1.4E-01	A	1.4E-01	X DF 2	1.4E-01	X DF3	3.8E+03	X DF 3	1.8E+04
Naphthalene	91-20-3	1.9E+02	N	1.4E+03	N	4.8E+00	A	3.0E+00	X DF 2	8.1E+01	X DF3	1.1E+02	X DF 3	NA
Phenanthrene	85-01-8	2.3E+04	N	5.4E+05	N	2.2E+03	A	2.2E+03	X DF 2	3.9E+02	X DF3	4.0E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	6.0E+04	N	3.7E+03	A	3.7E+03	X DF 2	3.7E+03	X DF3	3.7E+03	X DF 3	NA
Toluene	108-88-3	2.0E+03	N	1.5E+04	N	5.9E+01	A	5.9E+01	X DF 2	3.6E+02	X DF3	1.6E+03	SS	1.6E+03
Xylene(mixed)	1330-20-7	5.7E+02	N	3.9E+03	N	4.4E+02	SS	4.4E+02	SS	4.4E+02	SS	4.4E+02	SS	4.4E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	2.9E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	4.6E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	5.9E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.5E+03	N	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	2.1E+03	N	1.0E+04	O,T	3.4E+02	A	3.4E+02	X DF2	1.4E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.6E+03	N	1.0E+04	O,T	6.8E+02	A	6.8E+02	X DF2	2.7E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.7E+03	N	1.0E+04	O,T	6.9E+03	A	6.9E+03	X DF2	6.4E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.5E+03	N,I	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.5E+03	N,I	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 12
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 30 feet
foc = 0.02

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	1.6E-07	X DF 3	1.6E-07	X DF 3	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	1.6E-06	X DF 3	1.6E-06	X DF 3	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	6.6E-09	X DF 3	6.6E-09	X DF 3	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	6.6E-08	X DF 3	6.6E-08	X DF 3	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 16
STANDARDS FOR SOIL
(mg/kg)
Source Length = 30 feet
foc = 0.03

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.4E+03	N	9.9E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.3E+03	X DF3	1.6E+03	X DF 3	NA
Acenaphthylene	208-96-8	4.3E+03	N	9.2E+04	N	4.4E+02	A	4.4E+02	X DF 2	6.8E+02	X DF3	9.2E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.7E+05	N	6.1E+02	A	6.1E+02	X DF 2	6.1E+02	X DF3	6.1E+02	X DF 3	NA
Benzene	71-43-2	4.7E+00	C	1.1E+01	C	2.0E-01	A	2.0E-01	X DF 2	4.4E-02	X DF3	5.0E-01	X DF 3	3.5E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	1.7E+03	A	2.0E+01	X DF 2	8.1E-02	X DF3	8.2E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	1.1E+03	A	6.7E+01	X DF 2	1.2E-01	X DF3	1.2E-01	X DF 3	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	5.9E+02	A	5.9E+02	X DF 2	1.2E+00	X DF3	1.2E+00	X DF 3	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	3.8E+02	A	3.8E+02	X DF 2	9.0E+00	X DF3	9.1E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	2.7E+03	A	9.8E+00	X DF 2	7.1E-03	X DF3	7.1E-03	X DF 3	NA
Ethyl benzene	100-41-4	4.0E+03	N	4.4E+04	N	8.8E+01	A	8.8E+01	X DF 2	3.0E+02	X DF3	1.0E+03	X DF 3	1.1E+03
Fluoranthene	206-44-0	2.3E+03	N	3.0E+04	N	6.1E+03	A	6.1E+03	X DF 2	9.1E+02	X DF3	9.3E+02	X DF 3	NA
Fluorene	86-73-7	3.0E+03	N	7.3E+04	N	1.1E+03	A	1.1E+03	X DF 2	3.4E+02	X DF3	3.6E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	4.6E+01	A	4.6E+01	X DF 2	1.4E-01	X DF3	1.4E-01	X DF 3	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	1.1E+04	N	8.7E+04	N	6.1E+00	A	6.1E+00	X DF 2	6.4E+01	X DF3	1.2E+03	X DF 3	3.5E+04
Methyl isobutyl ketone	108-10-1	5.4E+03	N	1.0E+05	N	1.2E+01	A	1.2E+01	X DF 2	1.6E+01	X DF3	1.9E+02	X DF 3	5.9E+03
Methylnaphthalene,2-	91-57-6	6.4E+02	N	6.1E+03	N	8.4E+00	A	8.4E+00	X DF 2	3.5E+01	X DF3	3.6E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	1.6E+04	N	1.3E+05	N	1.8E-01	A	1.8E-01	X DF 2	1.8E-01	X DF3	5.1E+03	X DF 3	2.4E+04
Naphthalene	91-20-3	2.3E+02	N	1.4E+03	N	7.2E+00	A	4.5E+00	X DF 2	1.2E+02	X DF3	1.6E+02	X DF 3	NA
Phenanthrene	85-01-8	2.3E+04	N	5.5E+05	N	3.3E+03	A	3.3E+03	X DF 2	5.8E+02	X DF3	5.9E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	6.0E+04	N	5.5E+03	A	5.5E+03	X DF 2	5.5E+03	X DF3	5.5E+03	X DF 3	NA
Toluene	108-88-3	2.4E+03	N	1.8E+04	N	8.7E+01	A	8.7E+01	X DF 2	5.3E+02	X DF3	2.3E+03	SS	2.3E+03
Xylene(mixed)	1330-20-7	6.8E+02	N	4.7E+03	N	6.4E+02	SS	6.4E+02	SS	6.4E+02	SS	6.4E+02	SS	6.4E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	3.3E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	5.0E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	6.2E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.6E+03	N	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	2.2E+03	N	1.0E+04	O,T	5.1E+02	A	5.1E+02	X DF2	2.0E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.7E+03	N	1.0E+04	O,T	1.0E+03	A	1.0E+03	X DF2	4.0E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	9.6E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.6E+03	N,I	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.6E+03	N,I	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 16
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 30 feet
foc = 0.03

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	1.6E-07	X DF 3	1.6E-07	X DF 3	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	1.6E-06	X DF 3	1.6E-06	X DF 3	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	6.6E-09	X DF 3	6.6E-09	X DF 3	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	6.6E-08	X DF 3	6.6E-08	X DF 3	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 3
STANDARDS FOR SOIL
(mg/kg)
Source Length = 65 feet
foc = 0.006

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.0E+03	N	7.1E+04	N	2.2E+02	A	2.2E+02	X DF 2	2.5E+02	X DF3	3.2E+02	X DF 3	NA
Acenaphthylene	208-96-8	3.7E+03	N	6.1E+04	N	8.8E+01	A	8.8E+01	X DF 2	1.4E+02	X DF3	1.9E+02	X DF 3	NA
Anthracene	120-12-7	2.2E+04	N	5.1E+05	N	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Benzene	71-43-2	2.0E+00	C	4.2E+00	C	5.1E-02	A	5.1E-02	X DF 2	1.1E-02	X DF3	1.3E-01	X DF 3	9.0E+02
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	3.3E+02	A	3.9E+00	X DF 2	1.6E-02	X DF3	1.6E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	2.3E+01	A	2.3E+01	X DF 2	2.3E+01	X DF3	2.3E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	2.2E+02	A	1.3E+01	X DF 2	2.3E-02	X DF3	2.3E-02	X DF 3	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	1.2E+02	A	1.2E+02	X DF 2	2.3E-01	X DF3	2.3E-01	X DF 3	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	7.6E+01	A	7.6E+01	X DF 2	1.8E+00	X DF3	1.8E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	5.4E+02	A	2.0E+00	F	2.0E+00	G	2.0E+00	G	NA
Ethyl benzene	100-41-4	2.1E+03	N	1.7E+04	N	1.9E+01	A	1.9E+01	X DF 2	6.6E+01	X DF3	2.2E+02	X DF 3	2.3E+02
Fluoranthene	206-44-0	2.3E+03	N	2.9E+04	N	1.2E+03	A	1.2E+03	X DF 2	1.8E+02	X DF3	1.9E+02	X DF 3	NA
Fluorene	86-73-7	2.9E+03	N	5.9E+04	N	2.3E+02	A	2.3E+02	X DF 2	6.8E+01	X DF3	7.2E+01	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	9.2E+00	A	9.2E+00	X DF 2	9.2E+00	G	9.2E+00	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	7.7E+03	N	5.9E+04	N	5.0E+00	A	5.0E+00	X DF 2	5.2E+01	X DF3	1.0E+03	X DF 3	2.9E+04
Methyl isobutyl ketone	108-10-1	4.8E+03	N	7.6E+04	N	6.4E+00	A	6.4E+00	X DF 2	8.3E+00	X DF3	9.7E+01	X DF 3	3.1E+03
Methylnaphthalene,2-	91-57-6	2.9E+02	N	2.2E+03	N	1.7E+00	A	1.7E+00	X DF 2	7.0E+00	X DF3	7.3E+00	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	8.6E+03	N	6.4E+04	N	7.7E-02	A	7.7E-02	X DF 2	7.7E-02	X DF3	2.1E+03	X DF 3	9.8E+03
Naphthalene	91-20-3	8.4E+01	N	5.8E+02	N	1.5E+00	A	9.0E-01	X DF 2	2.5E+01	X DF3	3.2E+01	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	4.6E+05	N	6.6E+02	A	6.6E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.7E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.1E+03	X DF3	1.1E+03	X DF 3	NA
Toluene	108-88-3	9.1E+02	N	6.4E+03	N	2.0E+01	A	2.0E+01	X DF 2	1.2E+02	X DF3	5.2E+02	SS	5.2E+02
Xylene(mixed)	1330-20-7	2.4E+02	N	1.6E+03	N	1.5E+02	SS	1.5E+02	SS	1.5E+02	SS	1.5E+02	SS	1.5E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	1.5E+03	N	1.0E+04	O,T	5.3E+03	A	5.3E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	2.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	4.3E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	8.2E+02	N	6.8E+03	N	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF3	NA
Aromatics >C10-C12	NA	1.4E+03	N	1.0E+04	O,T	1.0E+02	A	1.0E+02	X DF2	4.1E+02	X DF3	9.6E+03	X DF3	NA
Aromatics >C12-C16	NA	2.0E+03	N	1.0E+04	O,T	2.0E+02	A	2.0E+02	X DF2	8.1E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.6E+03	N	1.0E+04	O,T	2.1E+03	A	2.1E+03	X DF2	1.9E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	8.2E+02	N,I	6.8E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF 3	NA
TPH-DRO	NA	8.2E+02	N,I	6.8E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF 3	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 3
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 65 feet
foc = 0.006

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	1.6E-07	X DF 3	1.6E-07	X DF 3	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	1.6E-06	X DF 3	1.6E-06	X DF 3	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 7
STANDARDS FOR SOIL
(mg/kg)
Source Length = 65 feet
foc = 0.01

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.1E+03	N	7.8E+04	N	3.6E+02	A	3.6E+02	X DF 2	4.2E+02	X DF3	5.3E+02	X DF 3	NA
Acenaphthylene	208-96-8	3.9E+03	N	6.9E+04	N	1.5E+02	A	1.5E+02	X DF 2	2.3E+02	X DF3	3.1E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.3E+05	N	2.0E+02	A	2.0E+02	X DF 2	2.0E+02	X DF3	2.0E+02	X DF 3	NA
Benzene	71-43-2	2.4E+00	C	5.1E+00	C	7.6E-02	A	7.6E-02	X DF 2	1.7E-02	X DF3	1.9E-01	X DF 3	1.3E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	5.6E+02	A	6.5E+00	X DF 2	2.7E-02	X DF3	2.7E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	3.9E+01	A	3.9E+01	X DF 2	3.9E+01	X DF3	3.9E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	3.7E+02	A	2.2E+01	X DF 2	3.9E-02	X DF3	3.9E-02	X DF 3	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	2.0E+02	A	2.0E+02	X DF 2	3.9E-01	X DF3	3.9E-01	X DF 3	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	1.3E+02	A	1.3E+02	X DF 2	3.0E+00	X DF3	3.0E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	8.9E+02	A	3.3E+00	X DF 2	3.3E+00	G	3.3E+00	G	NA
Ethyl benzene	100-41-4	2.5E+03	N	2.1E+04	N	3.1E+01	A	3.1E+01	X DF 2	1.0E+02	X DF3	3.5E+02	X DF 3	3.7E+02
Fluoranthene	206-44-0	2.3E+03	N	2.9E+04	N	2.0E+03	A	2.0E+03	X DF 2	3.0E+02	X DF3	3.1E+02	X DF 3	NA
Fluorene	86-73-7	2.9E+03	N	6.3E+04	N	3.8E+02	A	3.8E+02	X DF 2	1.1E+02	X DF3	1.2E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	1.5E+01	A	1.5E+01	X DF 2	1.5E+01	G	1.5E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	7.8E+03	N	6.0E+04	N	5.2E+00	A	5.2E+00	X DF 2	5.4E+01	X DF3	1.1E+03	X DF 3	3.0E+04
Methyl isobutyl ketone	108-10-1	4.9E+03	N	7.9E+04	N	7.4E+00	A	7.4E+00	X DF 2	9.5E+00	X DF3	1.1E+02	X DF 3	3.5E+03
Methylnaphthalene,2-	91-57-6	3.5E+02	N	2.8E+03	N	2.8E+00	A	2.8E+00	X DF 2	1.2E+01	X DF3	1.2E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	9.5E+03	N	7.1E+04	N	9.5E-02	A	9.5E-02	X DF 2	9.5E-02	X DF3	2.6E+03	X DF 3	1.2E+04
Naphthalene	91-20-3	1.1E+02	N	7.4E+02	N	2.4E+00	A	1.5E+00	X DF 2	4.1E+01	X DF3	5.4E+01	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	4.9E+05	N	1.1E+03	A	1.1E+03	X DF 2	1.9E+02	X DF3	2.0E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.8E+04	N	1.8E+03	A	1.8E+03	X DF 2	1.8E+03	X DF3	1.8E+03	X DF 3	NA
Toluene	108-88-3	1.1E+03	N	7.9E+03	N	3.1E+01	A	3.1E+01	X DF 2	1.9E+02	X DF3	8.1E+02	SS	8.1E+02
Xylene(mixed)	1330-20-7	3.0E+02	N	2.1E+03	N	2.3E+02	SS	2.3E+02	SS	2.3E+02	SS	2.3E+02	SS	2.3E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	1.9E+03	N	1.0E+04	O,T	8.7E+03	A	8.7E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	3.3E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	4.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	9.9E+02	N	8.6E+03	N	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.6E+03	N	1.0E+04	O,T	1.7E+02	A	1.7E+02	X DF2	6.8E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.2E+03	N	1.0E+04	O,T	3.4E+02	A	3.4E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.6E+03	N	1.0E+04	O,T	3.5E+03	A	3.5E+03	X DF2	3.2E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	9.9E+02	N,I	8.6E+03	N,I	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	9.9E+02	N,I	8.6E+03	N,I	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 7
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 65 feet
foc = 0.01

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	1.6E-07	X DF 3	1.6E-07	X DF 3	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	1.6E-06	X DF 3	1.6E-06	X DF 3	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 11
STANDARDS FOR SOIL
(mg/kg)
Source Length = 65 feet
foc = 0.02

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.3E+03	N	8.7E+04	N	7.2E+02	A	7.2E+02	X DF 2	8.4E+02	X DF3	1.1E+03	X DF 3	NA
Acenaphthylene	208-96-8	4.1E+03	N	7.9E+04	N	2.9E+02	A	2.9E+02	X DF 2	4.5E+02	X DF3	6.2E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.5E+05	N	4.0E+02	A	4.0E+02	X DF 2	4.0E+02	X DF3	4.0E+02	X DF 3	NA
Benzene	71-43-2	3.1E+00	C	6.8E+00	C	1.4E-01	A	1.4E-01	X DF 2	3.0E-02	X DF3	3.4E-01	X DF 3	2.4E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	1.1E+03	A	1.3E+01	X DF 2	5.4E-02	X DF3	5.4E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	7.7E+01	A	7.7E+01	X DF 2	7.7E+01	X DF3	7.7E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	7.4E+02	A	4.5E+01	X DF 2	7.8E-02	X DF3	7.8E-02	X DF 3	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	3.9E+02	A	3.9E+02	X DF 2	7.8E-01	X DF3	7.8E-01	X DF 3	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	2.5E+02	A	2.5E+02	X DF 2	6.0E+00	X DF3	6.1E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	1.8E+03	A	6.5E+00	X DF 2	6.5E+00	G	6.5E+00	G	NA
Ethyl benzene	100-41-4	3.0E+03	N	2.9E+04	N	5.9E+01	A	5.9E+01	X DF 2	2.0E+02	X DF3	6.9E+02	X DF 3	7.2E+02
Fluoranthene	206-44-0	2.3E+03	N	3.0E+04	N	4.0E+03	A	4.0E+03	X DF 2	6.1E+02	X DF3	6.2E+02	X DF 3	NA
Fluorene	86-73-7	3.0E+03	N	6.8E+04	N	7.5E+02	A	7.5E+02	X DF 2	2.3E+02	X DF3	2.4E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	3.1E+01	A	3.1E+01	X DF 2	3.1E+01	G	3.1E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	8.1E+03	N	6.2E+04	N	5.7E+00	A	5.7E+00	X DF 2	5.9E+01	X DF3	1.2E+03	X DF 3	3.3E+04
Methyl isobutyl ketone	108-10-1	5.1E+03	N	8.5E+04	N	9.9E+00	A	9.9E+00	X DF 2	1.3E+01	X DF3	1.5E+02	X DF 3	4.7E+03
Methylnaphthalene,2-	91-57-6	4.6E+02	N	3.9E+03	N	5.6E+00	A	5.6E+00	X DF 2	2.3E+01	X DF3	2.4E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	1.1E+04	N	8.5E+04	N	1.4E-01	A	1.4E-01	X DF 2	1.4E-01	X DF3	3.8E+03	X DF 3	1.8E+04
Naphthalene	91-20-3	1.5E+02	N	1.0E+03	N	4.8E+00	A	3.0E+00	X DF 2	8.1E+01	X DF3	1.1E+02	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	5.2E+05	N	2.2E+03	A	2.2E+03	X DF 2	3.9E+02	X DF3	4.0E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.9E+04	N	3.7E+03	A	3.7E+03	X DF 2	3.7E+03	X DF3	3.7E+03	X DF 3	NA
Toluene	108-88-3	1.5E+03	N	1.1E+04	N	5.9E+01	A	5.9E+01	X DF 2	3.6E+02	X DF3	1.6E+03	SS	1.6E+03
Xylene(mixed)	1330-20-7	4.2E+02	N	2.8E+03	N	4.4E+02	SS	4.4E+02	SS	4.4E+02	SS	4.4E+02	SS	4.4E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	2.4E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	4.0E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	5.4E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.2E+03	N	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.9E+03	N	1.0E+04	O,T	3.4E+02	A	3.4E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.4E+03	N	1.0E+04	O,T	6.8E+02	A	6.8E+02	X DF2	2.7E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.7E+03	N	1.0E+04	O,T	6.9E+03	A	6.9E+03	X DF2	6.4E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.2E+03	N,I	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.2E+03	N,I	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 11
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 65 feet
foc = 0.02

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	1.6E-07	X DF 3	1.6E-07	X DF 3	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	1.6E-06	X DF 3	1.6E-06	X DF 3	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 15
STANDARDS FOR SOIL
(mg/kg)
Source Length = 65 feet
foc = 0.03

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.3E+03	N	9.2E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.3E+03	X DF3	1.6E+03	X DF 3	NA
Acenaphthylene	208-96-8	4.2E+03	N	8.4E+04	N	4.4E+02	A	4.4E+02	X DF 2	6.8E+02	X DF3	9.2E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.6E+05	N	6.1E+02	A	6.1E+02	X DF 2	6.1E+02	X DF3	6.1E+02	X DF 3	NA
Benzene	71-43-2	3.6E+00	C	8.1E+00	C	2.0E-01	A	2.0E-01	X DF 2	4.4E-02	X DF3	5.0E-01	X DF 3	3.5E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	1.7E+03	A	2.0E+01	X DF 2	8.1E-02	X DF3	8.2E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	1.1E+03	A	6.7E+01	X DF 2	1.2E-01	X DF3	1.2E-01	X DF 3	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	5.9E+02	A	5.9E+02	X DF 2	1.2E+00	X DF3	1.2E+00	X DF 3	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	3.8E+02	A	3.8E+02	X DF 2	9.0E+00	X DF3	9.1E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	2.7E+03	A	9.8E+00	X DF 2	9.8E+00	G	9.8E+00	G	NA
Ethyl benzene	100-41-4	3.4E+03	N	3.4E+04	N	8.8E+01	A	8.8E+01	X DF 2	3.0E+02	X DF3	1.0E+03	X DF 3	1.1E+03
Fluoranthene	206-44-0	2.3E+03	N	3.0E+04	N	6.1E+03	A	6.1E+03	X DF 2	9.1E+02	X DF3	9.3E+02	X DF 3	NA
Fluorene	86-73-7	3.0E+03	N	7.0E+04	N	1.1E+03	A	1.1E+03	X DF 2	3.4E+02	X DF3	3.6E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	4.6E+01	A	4.6E+01	X DF 2	4.6E+01	G	4.6E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	8.4E+03	N	6.5E+04	N	6.1E+00	A	6.1E+00	X DF 2	6.4E+01	X DF3	1.2E+03	X DF 3	3.5E+04
Methyl isobutyl ketone	108-10-1	5.2E+03	N	8.9E+04	N	1.2E+01	A	1.2E+01	X DF 2	1.6E+01	X DF3	1.9E+02	X DF 3	5.9E+03
Methylnaphthalene,2-	91-57-6	5.2E+02	N	4.7E+03	N	8.4E+00	A	8.4E+00	X DF 2	3.5E+01	X DF3	3.6E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	1.2E+04	N	9.7E+04	N	1.8E-01	A	1.8E-01	X DF 2	1.8E-01	X DF3	5.1E+03	X DF 3	2.4E+04
Naphthalene	91-20-3	1.7E+02	N	1.3E+03	N	7.2E+00	A	4.5E+00	X DF 2	1.2E+02	X DF3	1.6E+02	X DF 3	NA
Phenanthrene	85-01-8	2.3E+04	N	5.4E+05	N	3.3E+03	A	3.3E+03	X DF 2	5.8E+02	X DF3	5.9E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.9E+04	N	5.5E+03	A	5.5E+03	X DF 2	5.5E+03	X DF3	5.5E+03	X DF 3	NA
Toluene	108-88-3	1.8E+03	N	1.3E+04	N	8.7E+01	A	8.7E+01	X DF 2	5.3E+02	X DF3	2.3E+03	SS	2.3E+03
Xylene(mixed)	1330-20-7	5.0E+02	N	3.4E+03	N	6.4E+02	SS	6.4E+02	SS	6.4E+02	SS	6.4E+02	SS	6.4E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	2.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	4.4E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	5.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.4E+03	N	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	2.0E+03	N	1.0E+04	O,T	5.1E+02	A	5.1E+02	X DF2	2.0E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.5E+03	N	1.0E+04	O,T	1.0E+03	A	1.0E+03	X DF2	4.0E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	9.6E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.4E+03	N,I	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.4E+03	N,I	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 15
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 65 feet
foc = 0.03

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	1.6E-07	X DF 3	1.6E-07	X DF 3	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	1.6E-06	X DF 3	1.6E-06	X DF 3	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 2
STANDARDS FOR SOIL
(mg/kg)
Source Length = 100 feet
foc = 0.006

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	3.8E+03	N	6.6E+04	N	2.2E+02	A	2.2E+02	X DF 2	2.5E+02	X DF3	3.2E+02	X DF 3	NA
Acenaphthylene	208-96-8	3.6E+03	N	5.6E+04	N	8.8E+01	A	8.8E+01	X DF 2	1.4E+02	X DF3	1.9E+02	X DF 3	NA
Anthracene	120-12-7	2.2E+04	N	4.9E+05	N	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Benzene	71-43-2	1.7E+00	C	3.6E+00	C	5.1E-02	A	5.1E-02	X DF 2	1.1E-02	X DF3	1.3E-01	X DF 3	9.0E+02
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	3.3E+02	A	3.9E+00	X DF 2	1.6E-02	X DF3	1.6E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	2.3E+01	A	2.3E+01	X DF 2	2.3E+01	X DF3	2.3E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	2.2E+02	A	1.3E+01	X DF 2	1.3E+01	G	1.3E+01	G	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	G	1.2E+02	G	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	7.6E+01	A	7.6E+01	X DF 2	1.8E+00	X DF3	1.8E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	5.4E+02	A	2.0E+00	X DF 2	2.0E+00	G	2.0E+00	G	NA
Ethyl benzene	100-41-4	1.8E+03	N	1.5E+04	N	1.9E+01	A	1.9E+01	X DF 2	6.6E+01	X DF3	2.2E+02	X DF 3	2.3E+02
Fluoranthene	206-44-0	2.3E+03	N	2.9E+04	N	1.2E+03	A	1.2E+03	X DF 2	1.8E+02	X DF3	1.9E+02	X DF 3	NA
Fluorene	86-73-7	2.8E+03	N	5.7E+04	N	2.3E+02	A	2.3E+02	X DF 2	6.8E+01	X DF3	7.2E+01	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	9.2E+00	A	9.2E+00	X DF 2	9.2E+00	G	9.2E+00	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	6.7E+03	N	5.0E+04	N	5.0E+00	A	5.0E+00	X DF 2	5.2E+01	X DF3	1.0E+03	X DF 3	2.9E+04
Methyl isobutyl ketone	108-10-1	4.6E+03	N	6.9E+04	N	6.4E+00	A	6.4E+00	X DF 2	8.3E+00	X DF3	9.7E+01	X DF 3	3.1E+03
Methylnaphthalene,2-	91-57-6	2.5E+02	N	1.9E+03	N	1.7E+00	A	1.7E+00	X DF 2	7.0E+00	X DF3	7.3E+00	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	7.5E+03	N	5.4E+04	N	7.7E-02	A	7.7E-02	X DF 2	7.7E-02	X DF3	2.1E+03	X DF 3	9.8E+03
Naphthalene	91-20-3	7.1E+01	N	4.9E+02	N	1.5E+00	A	9.0E-01	X DF 2	2.5E+01	X DF3	3.2E+01	X DF 3	NA
Phenanthrene	85-01-8	2.1E+04	N	4.4E+05	N	6.6E+02	A	6.6E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.7E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.1E+03	X DF3	1.1E+03	X DF 3	NA
Toluene	108-88-3	7.8E+02	N	5.4E+03	N	2.0E+01	A	2.0E+01	X DF 2	1.2E+02	X DF3	5.2E+02	SS	5.2E+02
Xylene(mixed)	1330-20-7	2.1E+02	N	1.4E+03	N	1.5E+02	SS	1.5E+02	SS	1.5E+02	SS	1.5E+02	SS	1.5E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	1.3E+03	N	1.0E+04	O,T	5.3E+03	A	5.3E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	2.5E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	4.0E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	7.3E+02	N	5.9E+03	N	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF3	NA
Aromatics >C10-C12	NA	1.3E+03	N	1.0E+04	O,T	1.0E+02	A	1.0E+02	X DF2	4.1E+02	X DF3	9.6E+03	X DF3	NA
Aromatics >C12-C16	NA	1.9E+03	N	1.0E+04	O,T	2.0E+02	A	2.0E+02	X DF2	8.1E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.5E+03	N	1.0E+04	O,T	2.1E+03	A	2.1E+03	X DF2	1.9E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	7.3E+02	N,I	5.9E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF 3	NA
TPH-DRO	NA	7.3E+02	N,I	5.9E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF 3	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 2
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 100 feet
foc = 0.006

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 6
STANDARDS FOR SOIL
(mg/kg)
Source Length = 100 feet
foc = 0.01

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.0E+03	N	7.3E+04	N	3.6E+02	A	3.6E+02	X DF 2	4.2E+02	X DF3	5.3E+02	X DF 3	NA
Acenaphthylene	208-96-8	3.8E+03	N	6.4E+04	N	1.5E+02	A	1.5E+02	X DF 2	2.3E+02	X DF3	3.1E+02	X DF 3	NA
Anthracene	120-12-7	2.2E+04	N	5.2E+05	N	2.0E+02	A	2.0E+02	X DF 2	2.0E+02	X DF3	2.0E+02	X DF 3	NA
Benzene	71-43-2	2.0E+00	C	4.3E+00	C	7.6E-02	A	7.6E-02	X DF 2	1.7E-02	X DF3	1.9E-01	X DF 3	1.3E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	5.6E+02	A	6.5E+00	X DF 2	2.7E-02	X DF3	2.7E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	3.9E+01	A	3.9E+01	X DF 2	3.9E+01	X DF3	3.9E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	3.7E+02	A	2.2E+01	X DF 2	2.2E+01	G	2.2E+01	G	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	2.0E+02	A	2.0E+02	X DF 2	2.0E+02	G	2.0E+02	G	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	1.3E+02	A	1.3E+02	X DF 2	3.0E+00	X DF3	3.0E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	8.9E+02	A	3.3E+00	X DF 2	3.3E+00	G	3.3E+00	G	NA
Ethyl benzene	100-41-4	2.2E+03	N	1.8E+04	N	3.1E+01	A	3.1E+01	X DF 2	1.0E+02	X DF3	3.5E+02	X DF 3	3.7E+02
Fluoranthene	206-44-0	2.3E+03	N	2.9E+04	N	2.0E+03	A	2.0E+03	X DF 2	3.0E+02	X DF3	3.1E+02	X DF 3	NA
Fluorene	86-73-7	2.9E+03	N	6.1E+04	N	3.8E+02	A	3.8E+02	X DF 2	1.1E+02	X DF3	1.2E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	1.5E+01	A	1.5E+01	X DF 2	1.5E+01	G	1.5E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	6.8E+03	N	5.1E+04	N	5.2E+00	A	5.2E+00	X DF 2	5.4E+01	X DF3	1.1E+03	X DF 3	3.0E+04
Methyl isobutyl ketone	108-10-1	4.7E+03	N	7.2E+04	N	7.4E+00	A	7.4E+00	X DF 2	9.5E+00	X DF3	1.1E+02	X DF 3	3.5E+03
Methylnaphthalene,2-	91-57-6	3.1E+02	N	2.4E+03	N	2.8E+00	A	2.8E+00	X DF 2	1.2E+01	X DF3	1.2E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	8.2E+03	N	6.0E+04	N	9.5E-02	A	9.5E-02	X DF 2	9.5E-02	X DF3	2.6E+03	X DF 3	1.2E+04
Naphthalene	91-20-3	9.0E+01	N	6.3E+02	N	2.4E+00	A	1.5E+00	X DF 2	4.1E+01	X DF3	5.4E+01	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	4.7E+05	N	1.1E+03	A	1.1E+03	X DF 2	1.9E+02	X DF3	2.0E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.8E+04	N	1.8E+03	A	1.8E+03	X DF 2	1.8E+03	X DF3	1.8E+03	X DF 3	NA
Toluene	108-88-3	9.6E+02	N	6.7E+03	N	3.1E+01	A	3.1E+01	X DF 2	1.9E+02	X DF3	8.1E+02	SS	8.1E+02
Xylene(mixed)	1330-20-7	2.6E+02	N	1.7E+03	N	2.3E+02	SS	2.3E+02	SS	2.3E+02	SS	2.3E+02	SS	2.3E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	1.6E+03	N	1.0E+04	O,T	8.7E+03	A	8.7E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	3.0E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	4.5E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	8.8E+02	N	7.4E+03	N	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.5E+03	N	1.0E+04	O,T	1.7E+02	A	1.7E+02	X DF2	6.8E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.1E+03	N	1.0E+04	O,T	3.4E+02	A	3.4E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.6E+03	N	1.0E+04	O,T	3.5E+03	A	3.5E+03	X DF2	3.2E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	8.8E+02	N,I	7.4E+03	O,T	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	8.8E+02	N,I	7.4E+03	O,T	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 6
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 100 feet
foc = 0.01

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECA
APPENDIX I
CATEGORY 10
STANDARDS FOR SOIL
(mg/kg)
Source Length = 100 feet
foc = 0.02

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.2E+03	N	8.3E+04	N	7.2E+02	A	7.2E+02	X DF 2	8.4E+02	X DF3	1.1E+03	X DF 3	NA
Acenaphthylene	208-96-8	4.0E+03	N	7.4E+04	N	2.9E+02	A	2.9E+02	X DF 2	4.5E+02	X DF3	6.2E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.4E+05	N	4.0E+02	A	4.0E+02	X DF 2	4.0E+02	X DF3	4.0E+02	X DF 3	NA
Benzene	71-43-2	2.7E+00	C	5.8E+00	C	1.4E-01	A	1.4E-01	X DF 2	3.0E-02	X DF3	3.4E-01	X DF 3	2.4E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	1.1E+03	A	1.3E+01	X DF 2	5.4E-02	X DF3	5.4E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	7.7E+01	A	7.7E+01	X DF 2	7.7E+01	X DF3	7.7E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	7.4E+02	A	4.5E+01	X DF 2	4.5E+01	G	4.5E+01	G	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	3.9E+02	A	3.9E+02	X DF 2	3.9E+02	G	3.9E+02	G	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	2.5E+02	A	2.5E+02	X DF 2	6.0E+00	X DF3	6.1E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	1.8E+03	A	6.5E+00	X DF 2	6.5E+00	G	6.5E+00	G	NA
Ethyl benzene	100-41-4	2.7E+03	N	2.5E+04	N	5.9E+01	A	5.9E+01	X DF 2	2.0E+02	X DF3	6.9E+02	X DF 3	7.2E+02
Fluoranthene	206-44-0	2.3E+03	N	2.9E+04	N	4.0E+03	A	4.0E+03	X DF 2	6.1E+02	X DF3	6.2E+02	X DF 3	NA
Fluorene	86-73-7	2.9E+03	N	6.6E+04	N	7.5E+02	A	7.5E+02	X DF 2	2.3E+02	X DF3	2.4E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	3.1E+01	A	3.1E+01	X DF 2	3.1E+01	G	3.1E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	7.1E+03	N	5.3E+04	N	5.7E+00	A	5.7E+00	X DF 2	5.9E+01	X DF3	1.2E+03	X DF 3	3.3E+04
Methyl isobutyl ketone	108-10-1	4.9E+03	N	7.8E+04	N	9.9E+00	A	9.9E+00	X DF 2	1.3E+01	X DF3	1.5E+02	X DF 3	4.7E+03
Methylnaphthalene,2-	91-57-6	4.0E+02	N	3.3E+03	N	5.6E+00	A	5.6E+00	X DF 2	2.3E+01	X DF3	2.4E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	9.7E+03	N	7.2E+04	N	1.4E-01	A	1.4E-01	X DF 2	1.4E-01	X DF3	3.8E+03	X DF 3	1.8E+04
Naphthalene	91-20-3	1.2E+02	N	8.8E+02	N	4.8E+00	A	3.0E+00	X DF 2	8.1E+01	X DF3	1.1E+02	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	5.1E+05	N	2.2E+03	A	2.2E+03	X DF 2	3.9E+02	X DF3	4.0E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.9E+04	N	3.7E+03	A	3.7E+03	X DF 2	3.7E+03	X DF3	3.7E+03	X DF 3	NA
Toluene	108-88-3	1.3E+03	N	9.2E+03	N	5.9E+01	A	5.9E+01	X DF 2	3.6E+02	X DF3	1.6E+03	SS	1.6E+03
Xylene(mixed)	1330-20-7	3.5E+02	N	2.4E+03	N	4.4E+02	SS	4.4E+02	SS	4.4E+02	SS	4.4E+02	SS	4.4E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	2.1E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	3.6E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	5.1E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.1E+03	N	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.8E+03	N	1.0E+04	O,T	3.4E+02	A	3.4E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.3E+03	N	1.0E+04	O,T	6.8E+02	A	6.8E+02	X DF2	2.7E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.6E+03	N	1.0E+04	O,T	6.9E+03	A	6.9E+03	X DF2	6.4E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.1E+03	N,I	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.1E+03	N,I	1.0E+04	O,T	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 10
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 100 feet
foc = 0.02

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 14
STANDARDS FOR SOIL
(mg/kg)
Source Length = 100 feet
foc = 0.03

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.3E+03	N	8.8E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.3E+03	X DF3	1.6E+03	X DF 3	NA
Acenaphthylene	208-96-8	4.1E+03	N	8.0E+04	N	4.4E+02	A	4.4E+02	X DF 2	6.8E+02	X DF3	9.2E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.5E+05	N	6.1E+02	A	6.1E+02	X DF 2	6.1E+02	X DF3	6.1E+02	X DF 3	NA
Benzene	71-43-2	3.1E+00	C	6.9E+00	C	2.0E-01	A	2.0E-01	X DF 2	4.4E-02	X DF3	5.0E-01	X DF 3	3.5E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	1.7E+03	A	2.0E+01	X DF 2	8.1E-02	X DF3	8.2E-02	X DF 3	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	1.1E+03	A	6.7E+01	X DF 2	6.7E+01	G	6.7E+01	G	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	5.9E+02	A	5.9E+02	X DF 2	5.9E+02	G	5.9E+02	G	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	3.8E+02	A	3.8E+02	X DF 2	9.0E+00	X DF3	9.1E+00	X DF 3	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	2.7E+03	A	9.8E+00	X DF 2	9.8E+00	G	9.8E+00	G	NA
Ethyl benzene	100-41-4	3.1E+03	N	2.9E+04	N	8.8E+01	A	8.8E+01	X DF 2	3.0E+02	X DF3	1.0E+03	X DF 3	1.1E+03
Fluoranthene	206-44-0	2.3E+03	N	3.0E+04	N	6.1E+03	A	6.1E+03	X DF 2	9.1E+02	X DF3	9.3E+02	X DF 3	NA
Fluorene	86-73-7	3.0E+03	N	6.8E+04	N	1.1E+03	A	1.1E+03	X DF 2	3.4E+02	X DF3	3.6E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	4.6E+01	A	4.6E+01	X DF 2	4.6E+01	G	4.6E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	7.3E+03	N	5.5E+04	N	6.1E+00	A	6.1E+00	X DF 2	6.4E+01	X DF3	1.2E+03	X DF 3	3.5E+04
Methyl isobutyl ketone	108-10-1	5.0E+03	N	8.3E+04	N	1.2E+01	A	1.2E+01	X DF 2	1.6E+01	X DF3	1.9E+02	X DF 3	5.9E+03
Methylnaphthalene,2-	91-57-6	4.7E+02	N	4.0E+03	N	8.4E+00	A	8.4E+00	X DF 2	3.5E+01	X DF3	3.6E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	1.1E+04	N	8.3E+04	N	1.8E-01	A	1.8E-01	X DF 2	1.8E-01	X DF3	5.1E+03	X DF 3	2.4E+04
Naphthalene	91-20-3	1.5E+02	N	1.1E+03	N	7.2E+00	A	4.5E+00	X DF 2	1.2E+02	X DF3	1.6E+02	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	5.2E+05	N	3.3E+03	A	3.3E+03	X DF 2	5.8E+02	X DF3	5.9E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.9E+04	N	5.5E+03	A	5.5E+03	X DF 2	5.5E+03	X DF3	5.5E+03	X DF 3	NA
Toluene	108-88-3	1.5E+03	N	1.1E+04	N	8.7E+01	A	8.7E+01	X DF 2	5.3E+02	X DF3	2.3E+03	SS	2.3E+03
Xylene(mixed)	1330-20-7	4.3E+02	N	2.9E+03	N	6.4E+02	SS	6.4E+02	SS	6.4E+02	SS	6.4E+02	SS	6.4E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	2.4E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	4.0E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	5.4E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.3E+03	N	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.9E+03	N	1.0E+04	O,T	5.1E+02	A	5.1E+02	X DF2	2.0E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.4E+03	N	1.0E+04	O,T	1.0E+03	A	1.0E+03	X DF2	4.0E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	9.6E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.3E+03	N,I	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.3E+03	N,I	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 14
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 100 feet
foc = 0.03

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 1
STANDARDS FOR SOIL
(mg/kg)
Source Length = 148 feet
foc = 0.006

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	3.7E+03	N	6.1E+04	N	2.2E+02	A	2.2E+02	X DF 2	2.5E+02	X DF3	3.2E+02	X DF 3	NA
Acenaphthylene	208-96-8	3.5E+03	N	5.1E+04	N	8.8E+01	A	8.8E+01	X DF 2	1.4E+02	X DF3	1.9E+02	X DF 3	NA
Anthracene	120-12-7	2.2E+04	N	4.8E+05	N	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Benzene	71-43-2	1.5E+00	C	3.1E+00	C	5.1E-02	A	5.1E-02	X DF 2	1.1E-02	X DF3	1.3E-01	X DF 3	9.0E+02
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	3.3E+02	A	3.9E+00	X DF 2	3.9E+00	G	3.9E+00	G	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	2.3E+01	A	2.3E+01	X DF 2	2.3E+01	X DF3	2.3E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	2.2E+02	A	1.3E+01	X DF 2	1.3E+01	G	1.3E+01	G	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	G	1.2E+02	G	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	7.6E+01	A	7.6E+01	X DF 2	7.6E+01	G	7.6E+01	G	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	5.4E+02	A	5.4E+02	F	5.4E+02	H	5.4E+02	H	NA
Ethyl benzene	100-41-4	1.6E+03	N	1.3E+04	N	1.9E+01	A	1.9E+01	X DF 2	6.6E+01	X DF3	2.2E+02	X DF 3	2.3E+02
Fluoranthene	206-44-0	2.2E+03	N	2.9E+04	N	1.2E+03	A	1.2E+03	X DF 2	1.8E+02	X DF3	1.9E+02	X DF 3	NA
Fluorene	86-73-7	2.8E+03	N	5.4E+04	N	2.3E+02	A	2.3E+02	X DF 2	6.8E+01	X DF3	7.2E+01	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	9.2E+00	A	9.2E+00	X DF 2	9.2E+00	G	9.2E+00	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	5.9E+03	N	4.4E+04	N	5.0E+00	A	5.0E+00	X DF 2	5.2E+01	X DF3	1.0E+03	X DF 3	2.9E+04
Methyl isobutyl ketone	108-10-1	4.5E+03	N	6.3E+04	N	6.4E+00	A	6.4E+00	X DF 2	8.3E+00	X DF3	9.7E+01	X DF 3	3.1E+03
Methylnaphthalene,2-	91-57-6	2.2E+02	N	1.7E+03	N	1.7E+00	A	1.7E+00	X DF 2	7.0E+00	X DF3	7.3E+00	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	6.5E+03	N	4.7E+04	N	7.7E-02	A	7.7E-02	X DF 2	7.7E-02	X DF3	2.1E+03	X DF 3	9.8E+03
Naphthalene	91-20-3	6.2E+01	N	4.3E+02	N	1.5E+00	A	9.0E-01	X DF 2	2.5E+01	X DF3	3.2E+01	X DF 3	NA
Phenanthrene	85-01-8	2.1E+04	N	4.3E+05	N	6.6E+02	A	6.6E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.6E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.1E+03	X DF3	1.1E+03	X DF 3	NA
Toluene	108-88-3	6.8E+02	N	4.7E+03	N	2.0E+01	A	2.0E+01	X DF 2	1.2E+02	X DF3	5.2E+02	SS	5.2E+02
Xylene(mixed)	1330-20-7	1.8E+02	N	1.2E+03	N	1.5E+02	SS	1.5E+02	SS	1.5E+02	SS	1.5E+02	SS	1.5E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	1.2E+03	N	8.8E+03	N	5.3E+03	A	5.3E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	2.3E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	3.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	6.5E+02	N	5.1E+03	N	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF3	NA
Aromatics >C10-C12	NA	1.2E+03	N	1.0E+04	O,T	1.0E+02	A	1.0E+02	X DF2	4.1E+02	X DF3	9.6E+03	X DF3	NA
Aromatics >C12-C16	NA	1.8E+03	N	1.0E+04	O,T	2.0E+02	A	2.0E+02	X DF2	8.1E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.5E+03	N	1.0E+04	O,T	2.1E+03	A	2.1E+03	X DF2	1.9E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	6.5E+02	N,I	5.1E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF 3	NA
TPH-DRO	NA	6.5E+02	N,I	5.1E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF 3	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 1
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 148 feet
foc = 0.006

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	9.1E-03	H	9.1E-03	H	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	2.5E-03	F	2.5E-03	G	2.5E-03	G	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 5
STANDARDS FOR SOIL
(mg/kg)
Source Length = 148 feet
foc = 0.01

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	3.9E+03	N	6.9E+04	N	3.6E+02	A	3.6E+02	X DF 2	4.2E+02	X DF3	5.3E+02	X DF 3	NA
Acenaphthylene	208-96-8	3.7E+03	N	5.9E+04	N	1.5E+02	A	1.5E+02	X DF 2	2.3E+02	X DF3	3.1E+02	X DF 3	NA
Anthracene	120-12-7	2.2E+04	N	5.0E+05	N	2.0E+02	A	2.0E+02	X DF 2	2.0E+02	X DF3	2.0E+02	X DF 3	NA
Benzene	71-43-2	1.8E+00	C	3.7E+00	C	7.6E-02	A	7.6E-02	X DF 2	1.7E-02	X DF3	1.9E-01	X DF 3	1.3E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	5.6E+02	A	6.5E+00	X DF 2	6.5E+00	G	6.5E+00	G	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	3.9E+01	A	3.9E+01	X DF 2	3.9E+01	X DF3	3.9E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	3.7E+02	A	2.2E+01	X DF 2	2.2E+01	G	2.2E+01	G	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	2.0E+02	A	2.0E+02	X DF 2	2.0E+02	G	2.0E+02	G	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	1.3E+02	A	1.3E+02	X DF 2	1.3E+02	G	1.3E+02	G	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	8.9E+02	A	8.9E+02	F	8.9E+02	H	8.9E+02	H	NA
Ethyl benzene	100-41-4	2.0E+03	N	1.6E+04	N	3.1E+01	A	3.1E+01	X DF 2	1.0E+02	X DF3	3.5E+02	X DF 3	3.7E+02
Fluoranthene	206-44-0	2.3E+03	N	2.9E+04	N	2.0E+03	A	2.0E+03	X DF 2	3.0E+02	X DF3	3.1E+02	X DF 3	NA
Fluorene	86-73-7	2.8E+03	N	5.9E+04	N	3.8E+02	A	3.8E+02	X DF 2	1.1E+02	X DF3	1.2E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	1.5E+01	A	1.5E+01	X DF 2	1.5E+01	G	1.5E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	6.0E+03	N	4.4E+04	N	5.2E+00	A	5.2E+00	X DF 2	5.4E+01	X DF3	1.1E+03	X DF 3	3.0E+04
Methyl isobutyl ketone	108-10-1	4.6E+03	N	6.6E+04	N	7.4E+00	A	7.4E+00	X DF 2	9.5E+00	X DF3	1.1E+02	X DF 3	3.5E+03
Methylnaphthalene,2-	91-57-6	2.7E+02	N	2.1E+03	N	2.8E+00	A	2.8E+00	X DF 2	1.2E+01	X DF3	1.2E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	7.2E+03	N	5.2E+04	N	9.5E-02	A	9.5E-02	X DF 2	9.5E-02	X DF3	2.6E+03	X DF 3	1.2E+04
Naphthalene	91-20-3	7.9E+01	N	5.5E+02	N	2.4E+00	A	1.5E+00	X DF 2	4.1E+01	X DF3	5.3E+01	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	4.6E+05	N	1.1E+03	A	1.1E+03	X DF 2	1.9E+02	X DF3	2.0E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.7E+04	N	1.8E+03	A	1.8E+03	X DF 2	1.8E+03	X DF3	1.8E+03	X DF 3	NA
Toluene	108-88-3	8.4E+02	N	5.8E+03	N	3.1E+01	A	3.1E+01	X DF 2	1.9E+02	X DF3	8.1E+02	SS	8.1E+02
Xylene(mixed)	1330-20-7	2.2E+02	N	1.5E+03	N	2.3E+02	SS	2.3E+02	SS	2.3E+02	SS	2.3E+02	SS	2.3E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	1.4E+03	N	1.0E+04	O,T	8.7E+03	A	8.7E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	2.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	4.2E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	7.9E+02	N	6.5E+03	N	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.4E+03	N	1.0E+04	O,T	1.7E+02	A	1.7E+02	X DF2	6.8E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.0E+03	N	1.0E+04	O,T	3.4E+02	A	3.4E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.5E+03	N	1.0E+04	O,T	3.5E+03	A	3.5E+03	X DF2	3.2E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	7.9E+02	N,I	6.5E+03	N,I	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	7.9E+02	N,I	6.5E+03	N,I	1.1E+02	A	1.1E+02	X DF2	4.3E+02	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 5
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 148 feet
foc = 0.01

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	9.1E-03	H	9.1E-03	H	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	2.5E-03	F	2.5E-03	G	2.5E-03	G	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 9
STANDARDS FOR SOIL
(mg/kg)
Source Length = 148 feet
foc = 0.02

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.1E+03	N	7.9E+04	N	7.2E+02	A	7.2E+02	X DF 2	8.4E+02	X DF3	1.1E+03	X DF 3	NA
Acenaphthylene	208-96-8	3.9E+03	N	7.0E+04	N	2.9E+02	A	2.9E+02	X DF 2	4.5E+02	X DF3	6.2E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.3E+05	N	4.0E+02	A	4.0E+02	X DF 2	4.0E+02	X DF3	4.0E+02	X DF 3	NA
Benzene	71-43-2	2.3E+00	C	5.0E+00	C	1.4E-01	A	1.4E-01	X DF 2	3.0E-02	X DF3	3.4E-01	X DF 3	2.4E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	1.1E+03	A	1.3E+01	X DF 2	1.3E+01	G	1.3E+01	G	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	7.7E+01	A	7.7E+01	X DF 2	7.7E+01	X DF3	7.7E+01	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	7.4E+02	A	4.5E+01	X DF 2	4.5E+01	G	4.5E+01	G	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	3.9E+02	A	3.9E+02	X DF 2	3.9E+02	G	3.9E+02	G	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	2.5E+02	A	2.5E+02	X DF 2	2.5E+02	G	2.5E+02	G	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	1.8E+03	A	1.8E+03	F	1.8E+03	H	1.8E+03	H	NA
Ethyl benzene	100-41-4	2.5E+03	N	2.2E+04	N	5.9E+01	A	5.9E+01	X DF 2	2.0E+02	X DF3	6.8E+02	X DF 3	7.2E+02
Fluoranthene	206-44-0	2.3E+03	N	2.9E+04	N	4.0E+03	A	4.0E+03	X DF 2	6.1E+02	X DF3	6.2E+02	X DF 3	NA
Fluorene	86-73-7	2.9E+03	N	6.4E+04	N	7.5E+02	A	7.5E+02	X DF 2	2.3E+02	X DF3	2.4E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	3.1E+01	A	3.1E+01	X DF 2	3.1E+01	G	3.1E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	6.2E+03	N	4.6E+04	N	5.6E+00	A	5.6E+00	X DF 2	5.9E+01	X DF3	1.2E+03	X DF 3	3.3E+04
Methyl isobutyl ketone	108-10-1	4.7E+03	N	7.2E+04	N	9.9E+00	A	9.9E+00	X DF 2	1.3E+01	X DF3	1.5E+02	X DF 3	4.7E+03
Methylnaphthalene,2-	91-57-6	3.6E+02	N	2.9E+03	N	5.6E+00	A	5.6E+00	X DF 2	2.3E+01	X DF3	2.4E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	8.5E+03	N	6.3E+04	N	1.4E-01	A	1.4E-01	X DF 2	1.4E-01	X DF3	3.8E+03	X DF 3	1.8E+04
Naphthalene	91-20-3	1.1E+02	N	7.7E+02	N	4.8E+00	A	3.0E+00	X DF 2	8.1E+01	X DF3	1.1E+02	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	4.9E+05	N	2.2E+03	A	2.2E+03	X DF 2	3.9E+02	X DF3	4.0E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.8E+04	N	3.7E+03	A	3.7E+03	X DF 2	3.7E+03	X DF3	3.7E+03	X DF 3	NA
Toluene	108-88-3	1.1E+03	N	8.0E+03	N	5.9E+01	A	5.9E+01	X DF 2	3.6E+02	X DF3	1.6E+03	SS	1.6E+03
Xylene(mixed)	1330-20-7	3.1E+02	N	2.1E+03	N	4.4E+02	SS	4.4E+02	SS	4.4E+02	SS	4.4E+02	SS	4.4E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	1.9E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	3.4E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	4.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.0E+03	N	8.8E+03	N	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.6E+03	N	1.0E+04	O,T	3.4E+02	A	3.4E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.2E+03	N	1.0E+04	O,T	6.8E+02	A	6.8E+02	X DF2	2.7E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.6E+03	N	1.0E+04	O,T	6.9E+03	A	6.9E+03	X DF2	6.4E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.0E+03	N,I	8.8E+03	N,I	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.0E+03	N,I	8.8E+03	N,I	2.1E+02	A	2.1E+02	X DF2	8.5E+02	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 9
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 148 feet
foc = 0.02

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	9.1E-03	H	9.1E-03	H	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	2.5E-03	F	2.5E-03	G	2.5E-03	G	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE TI16 - 4)

LDEQ RECAP
APPENDIX I
CATEGORY 13
STANDARDS FOR SOIL
(mg/kg)
Source Length = 148 feet
foc = 0.03

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat
Acenaphthene	83-32-9	4.2E+03	N	8.5E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.3E+03	X DF3	1.6E+03	X DF 3	NA
Acenaphthylene	208-96-8	4.0E+03	N	7.6E+04	N	4.4E+02	A	4.4E+02	X DF 2	6.8E+02	X DF3	9.2E+02	X DF 3	NA
Anthracene	120-12-7	2.3E+04	N	5.4E+05	N	6.1E+02	A	6.1E+02	X DF 2	6.1E+02	X DF3	6.1E+02	X DF 3	NA
Benzene	71-43-2	2.7E+00	C	6.0E+00	C	2.0E-01	A	2.0E-01	X DF 2	4.4E-02	X DF3	5.0E-01	X DF 3	3.5E+03
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	1.7E+03	A	2.0E+01	X DF 2	2.0E+01	G	2.0E+01	G	NA
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA
Benzo(b)fluroanthene	205-99-2	6.2E-01	C	2.9E+00	C	1.1E+03	A	6.7E+01	X DF 2	6.7E+01	G	6.7E+01	G	NA
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	5.9E+02	A	5.9E+02	X DF 2	5.9E+02	G	5.9E+02	G	NA
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	3.8E+02	A	3.8E+02	X DF 2	3.8E+02	G	3.8E+02	G	NA
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	2.7E+03	A	2.7E+03	F	2.7E+03	H	2.7E+03	H	NA
Ethyl benzene	100-41-4	2.8E+03	N	2.6E+04	N	8.8E+01	A	8.8E+01	X DF 2	3.0E+02	X DF3	1.0E+03	X DF 3	1.1E+03
Fluoranthene	206-44-0	2.3E+03	N	3.0E+04	N	6.1E+03	A	6.1E+03	X DF 2	9.1E+02	X DF3	9.3E+02	X DF 3	NA
Fluorene	86-73-7	3.0E+03	N	6.7E+04	N	1.1E+03	A	1.1E+03	X DF 2	3.4E+02	X DF3	3.6E+02	X DF 3	NA
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	4.6E+01	A	4.6E+01	X DF 2	4.6E+01	G	4.6E+01	G	NA
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA
Methyl ethyl ketone	78-93-3	6.5E+03	N	4.8E+04	N	6.1E+00	A	6.1E+00	X DF 2	6.4E+01	X DF3	1.2E+03	X DF 3	3.5E+04
Methyl isobutyl ketone	108-10-1	4.8E+03	N	7.7E+04	N	1.2E+01	A	1.2E+01	X DF 2	1.6E+01	X DF3	1.9E+02	X DF 3	5.9E+03
Methylnaphthalene,2-	91-57-6	4.2E+02	N	3.5E+03	N	8.4E+00	A	8.4E+00	X DF 2	3.5E+01	X DF3	3.6E+01	X DF 3	NA
MTBE (methyl tert-butyl ether)	1634-04-4	9.6E+03	N	7.2E+04	N	1.8E-01	A	1.8E-01	X DF 2	1.8E-01	X DF3	5.1E+03	X DF 3	2.4E+04
Naphthalene	91-20-3	1.3E+02	N	9.3E+02	N	7.2E+00	A	4.5E+00	X DF 2	1.2E+02	X DF3	1.6E+02	X DF 3	NA
Phenanthrene	85-01-8	2.2E+04	N	5.1E+05	N	3.3E+03	A	3.3E+03	X DF 2	5.8E+02	X DF3	5.9E+02	X DF 3	NA
Pyrene	129-00-0	2.3E+03	N	5.9E+04	N	5.5E+03	A	5.5E+03	X DF 2	5.5E+03	X DF3	5.5E+03	X DF 3	NA
Toluene	108-88-3	1.4E+03	N	9.7E+03	N	8.7E+01	A	8.7E+01	X DF 2	5.3E+02	X DF3	2.3E+03	SS	2.3E+03
Xylene(mixed)	1330-20-7	3.7E+02	N	2.5E+03	N	6.4E+02	SS	6.4E+02	SS	6.4E+02	SS	6.4E+02	SS	6.4E+02
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C8-C10	NA	2.2E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C10-C12	NA	3.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C12-C16	NA	5.2E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
Aromatics >C8-C10	NA	1.1E+03	N	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C10-C12	NA	1.8E+03	N	1.0E+04	O,T	5.1E+02	A	5.1E+02	X DF2	2.0E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C12-C16	NA	2.4E+03	N	1.0E+04	O,T	1.0E+03	A	1.0E+03	X DF2	4.0E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C16-C21	NA	1.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	9.6E+03	X DF3	1.0E+04	O,T	NA
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA
TPH-GRO	NA	1.1E+03	N,I	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
TPH-DRO	NA	1.1E+03	N,I	1.0E+04	O,T	3.2E+02	A	3.2E+02	X DF2	1.3E+03	X DF3	1.0E+04	O,T	NA
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 3)

LDEQ RECAP
APPENDIX I
CATEGORY 13
STANDARDS FOR GROUNDWATER
(mg/l)
Source Length = 148 feet
foc = 0.03

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	9.4E-03
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03
Benzo(b)fluroanthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	9.1E-03	H	9.1E-03	H	1.6E-03
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	2.5E-03	F	2.5E-03	G	2.5E-03	G	2.5E-03
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA

NOTE: SEE END OF TABLES FOR DESIGNATION OF LETTERS (PAGE T I16 - 4)

LDEQ RECAP TABLE 1
SCREENING OPTION
SCREENING STANDARDS FOR SOIL AND GROUNDWATER

		SOIL_SSni		SOIL_SSi		SOIL_SSGW		GW_SS	
COMPOUND	CAS #	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/L)	NOTE
Acenaphthene	83-32-9	3.7E+02	N	6.1E+03	N	2.2E+02	A	3.7E-02	N
Acenaphthylene	208-96-8	3.5E+02	N	5.1E+03	N	8.8E+01	A	1.0E-01	Q
Acetone	67-64-1	1.7E+02	N	1.4E+03	N	1.5E+00	A	1.0E-01	Q
Aldrin	309-00-2	2.8E-02	C	1.3E-01	C	1.1E+01	A	1.9E-03	Q
Aniline	62-53-3	2.4E+00	N	1.7E+01	N	6.5E-02	A	1.2E-02	C
Anthracene	120-12-7	2.2E+03	N	4.8E+04	N	1.2E+02	A	4.3E-02	W
Antimony	7440-36-0	3.1E+00	N	8.2E+01	N	1.2E+01	L1	6.0E-03	MCL
Arsenic	7440-38-2	1.2E+01	D	1.2E+01	D	1.0E+02	L	1.0E-02	MCL
Barium	7440-39-3	5.5E+02	N	1.4E+04	N	2.0E+03	L	2.0E+00	MCL
Benzene	71-43-2	1.5E+00	C	3.1E+00	C	5.1E-02	A	5.0E-03	MCL
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	3.3E+02	A	7.8E-03	Q
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	2.3E+01	A	2.0E-04	MCL
Benzo(b)fluoranthene	205-99-2	6.2E-01	C	2.9E+00	C	2.2E+02	A	4.8E-03	Q
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	1.2E+02	A	2.5E-03	Q
Beryllium	7440-41-7	1.6E+01	N	4.1E+02	N	8.0E+00	L1	4.0E-03	MCL
Biphenyl,1,1-	92-52-4	2.3E+02	P	2.3E+02	P	1.9E+02	A	3.0E-02	N
Bis(2-chloroethyl)ether	111-44-4	3.3E-01	Q	1.1E+00	C	3.3E-01	Q	5.7E-03	Q
Bis(2-chloroisopropyl)ether	108-60-1	4.9E+00	C	1.7E+01	C	8.0E-01	Q	5.7E-03	Q
Bis(2-ethyl-hexyl)phthalate	117-81-7	3.5E+01	C	1.7E+02	C	7.9E+01	A	6.0E-03	MCL
Bromodichloromethane	75-27-4	1.8E+00	C	4.2E+00	C	9.2E-01	A	1.0E-01	MCL
Bromoform	75-25-2	4.8E+01	C	1.8E+02	C	1.8E+00	A	1.0E-01	MCL
Bromomethane	74-83-9	4.3E-01	N	3.0E+00	N	4.0E-02	A	1.0E-02	Q
Butyl benzyl phthalate	85-68-7	2.2E+02	P	2.2E+02	P	2.2E+02	P	7.3E-01	N
Cadmium	7440-43-9	3.9E+00	N	1.0E+02	N	2.0E+01	L	5.0E-03	MCL
Carbon Disulfide	75-15-0	3.6E+01	N	2.5E+02	N	1.1E+01	A	1.0E-01	N
Carbon Tetrachloride	56-23-5	1.8E-01	N	1.1E+00	C	1.1E-01	A	5.0E-03	MCL
Chlordane	57-74-9	1.6E+00	C	1.0E+01	C	1.2E+01	A	2.0E-03	MCL
Chloroaniline,p-	106-47-8	1.6E+01	N	1.7E+02	N	1.5E+00	A	2.0E-02	Q
Chlorobenzene	108-90-7	1.7E+01	N	1.2E+02	N	3.0E+00	A	1.0E-01	MCL
Chlorodibromomethane	124-48-1	2.2E+00	C	5.4E+00	C	1.0E+00	A	1.0E-01	MCL
Chloroethane (Ethylchloride)	75-00-3	4.1E+00	C	8.2E+00	C	3.5E-02	A	1.0E-02	Q
Chloroform	67-66-3	4.4E-02	N	3.0E-01	N	9.0E-01	A	1.0E-01	MCL
Chloromethane	74-87-3	3.5E+00	C	7.3E+00	C	1.0E-01	Q	1.0E-02	Q
Chloronaphthalene,2-	91-58-7	5.0E+02	N	8.3E+03	N	5.0E+02	A	4.9E-02	N
Chlorophenol,2-	95-57-8	1.5E+01	N	1.4E+02	N	1.4E+00	A	1.0E-02	Q
Chromium(III)	16065-83-1	1.2E+04	N	3.1E+05	N	1.0E+02	L	1.0E-01	MCL

NOTE: See end of Table for designation of letter symbols

LDEQ RECAP TABLE 1
SCREENING OPTION
SCREENING STANDARDS FOR SOIL AND GROUNDWATER

		SOIL_SSni		SOIL_SSi		SOIL_SSGW		GW_SS	
COMPOUND	CAS #	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/L)	NOTE
Chromium(VI)	18540-29-97	2.3E+01	N	6.1E+02	N	1.0E+02	L	1.0E-01	MCL
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	7.6E+01	A	1.6E-03	W
Cobalt	7440-48-4	4.7E+02	N	1.2E+04	N	4.4E+03	L1	2.2E-01	N
Copper	7440-50-8	3.1E+02	N	8.2E+03	N	1.5E+03	S	1.3E+00	MCL
Cyanide (free)	57-12-5	1.5E+02	N	3.6E+03	N	4.0E+02	L1	2.0E-01	MCL
DDD	72-54-8	2.4E+00	C	1.6E+01	C	1.5E+00	A	2.8E-04	C
DDE	72-55-9	1.7E+00	C	1.1E+01	C	2.0E+00	A	2.0E-04	C
DDT	50-29-3	1.7E+00	C	1.2E+01	C	2.4E+01	A	3.0E-04	Q
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	5.4E+02	A	2.5E-03	Q
Dibenzofuran	132-64-9	2.9E+01	N	1.5E+02	P	2.4E+01	A	1.0E-02	Q
Dibromo-3-chloropropane,1,2-	96-12-8	1.8E-01	N	1.6E+00	N	1.0E-02	Q	2.0E-04	MCL
Dichlorobenzene,1,2-	95-50-1	9.9E+01	N	3.8E+02	P	2.9E+01	A	6.0E-01	MCL
Dichlorobenzene,1,3-	541-73-1	2.1E+00	N	1.8E+01	N	2.1E+00	A	1.0E-02	Q
Dichlorobenzene,1,4-	106-46-7	6.7E+00	C	1.6E+01	C	5.7E+00	A	7.5E-02	MCL
Dichlorobenzidine,3,3-	91-94-1	9.7E-01	C	4.2E+00	C	1.8E+00	A	2.0E-02	Q
Dichloroethane,1,1-	75-34-3	6.6E+01	N	4.7E+02	N	7.5E+00	A	8.1E-02	N
Dichloroethane,1,2-	107-06-2	8.2E-01	C	1.8E+00	C	3.5E-02	A	5.0E-03	MCL
Dichloroethene,1,1-	75-35-4	1.3E+01	N	9.1E+01	N	8.5E-02	A	7.0E-03	MCL
Dichloroethene,cis,1,2-	156-59-2	4.8E+00	N	3.4E+01	N	4.9E-01	A	7.0E-02	MCL
Dichloroethene,trans,1,2-	156-60-5	6.9E+00	N	4.8E+01	N	7.7E-01	A	1.0E-01	MCL
Dichlorophenol,2,4-	120-83-2	1.6E+01	N	2.0E+02	N	1.2E+01	A	1.1E-02	N
Dichloropropane,1,2-	78-87-5	6.9E-01	N	1.8E+00	C	4.2E-02	A	5.0E-03	MCL
Dichloropropene,1,3-	542-75-6	3.1E+00	C	1.0E+01	C	4.0E-02	A	5.0E-03	Q
Dieldrin	60-57-1	3.0E-02	C	1.5E-01	C	7.6E+00	A	2.5E-03	Q
Diethylphthalate	84-66-2	6.7E+02	P	6.7E+02	P	3.6E+02	A	2.9E+00	N
Dimethylphenol,2,4-	105-67-9	9.3E+01	N	1.1E+03	N	2.0E+01	A	7.3E-02	N
Dimethylphthalate	131-11-3	1.5E+03	P	1.5E+03	P	1.5E+03	P	3.7E+01	N
Di-n-octylphthalate	117-84-0	2.4E+02	N	3.5E+03	N	1.0E+04	P	2.0E-02	W
Dinitrobenzene,1,3-	99-65-0	4.5E-01	N	5.0E+00	N	2.5E-01	Q	1.0E-02	Q
Dinitrophenol,2,4-	51-28-5	7.1E+00	N	6.9E+01	N	1.7E+00	Q	5.0E-02	Q
Dinitrotoluene,2,6-	606-20-2	4.3E+00	N	4.6E+01	N	3.9E-01	A	1.0E-02	Q
Dinitrotoluene,2,4-	121-14-2	8.9E+00	N	9.8E+01	N	1.0E+00	A	1.0E-02	Q
Dinoseb	88-85-7	4.7E+00	N	5.4E+01	N	1.4E-01	Q	7.0E-03	MCL
Endosulfan	115-29-7	3.4E+01	N	4.5E+02	N	5.4E+01	A	2.2E-02	N
Endrin	72-20-8	1.8E+00	N	2.5E+01	N	2.6E+00	A	2.0E-03	MCL
Ethyl benzene	100-41-4	1.6E+02	N	2.3E+02	P	1.9E+01	A	7.0E-01	MCL

NOTE: See end of Table for designation of letter symbols

LDEQ RECAP TABLE 1
SCREENING OPTION
SCREENING STANDARDS FOR SOIL AND GROUNDWATER

		SOIL_SSni		SOIL_SSi		SOIL_SSGW		GW_SS	
COMPOUND	CAS #	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/L)	NOTE
Fluoranthene	206-44-0	2.2E+02	N	2.9E+03	N	1.2E+03	A	1.5E-01	N
Fluorene	86-73-7	2.8E+02	N	5.4E+03	N	2.3E+02	A	2.4E-02	N
Heptachlor	76-44-8	1.6E-02	C	3.5E-02	C	5.0E-01	A	4.0E-04	MCL
Heptachlor epoxide	1024-57-3	5.3E-02	C	2.6E-01	C	2.0E+00	A	2.0E-04	MCL
Hexachlorobenzene	118-74-1	3.4E-01	C	2.0E+00	C	9.6E+00	A	1.0E-03	MCL
Hexachlorobutadiene	87-68-3	8.2E-01	N	8.6E+00	N	5.5E+00	A	7.3E-04	N
Hexachlorocyclohexane,alpha	319-84-6	8.2E-02	C	4.4E-01	C	6.4E-03	A	3.0E-05	Q
Hexachlorocyclohexane,beta	319-85-7	2.9E-01	C	1.6E+00	C	1.6E-02	A	6.0E-05	Q
Hexachlorocyclohexane,gamma	58-89-9	3.9E-01	C	2.0E+00	C	3.3E-02	A	2.0E-04	MCL
Hexachlorocyclopentadiene	77-47-4	1.4E+00	N	9.4E+00	N	1.2E+03	A	5.0E-02	MCL
Hexachloroethane	67-72-1	5.2E+00	N	6.8E+01	N	2.2E+00	A	1.0E-02	Q
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	9.2E+00	A	3.7E-03	Q
Isobutyl alcohol	78-83-1	7.3E+02	N	6.2E+03	N	3.0E+01	A	1.1E+00	N
Isophorone	78-59-1	3.4E+02	C	1.1E+03	C	5.6E-01	A	7.0E-02	C
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.5E-02	MCL
Mercury (inorganic)	7487-94-7	2.3E+00	N	6.1E+01	N	4.0E+00	L	2.0E-03	MCL
Methoxychlor	72-43-5	3.0E+01	N	4.3E+02	N	3.8E+02	A	4.0E-02	MCL
Methylene chloride	75-09-2	1.9E+01	C	4.4E+01	C	1.7E-02	A	5.0E-03	MCL
Methyl ethyl ketone	78-93-3	5.9E+02	N	4.4E+03	N	5.0E+00	A	1.9E-01	N
Methyl isobutyl ketone	108-10-1	4.5E+02	N	3.1E+03	P	6.4E+00	A	2.0E-01	N
Methylnaphthalene,2-	91-57-6	2.2E+01	N	1.7E+02	N	1.7E+00	A	6.2E-04	N
MTBE (methyl tert-butyl ether)	1634-04-4	6.5E+02	N	4.7E+03	N	7.7E-02	A	2.0E-02	T/O
Naphthalene	91-20-3	6.2E+00	N	4.3E+01	N	1.5E+00	A	1.0E-02	Q
Nickel	7440-02-0	1.6E+02	N	4.1E+03	N	1.5E+03	L1	7.3E-02	N
Nitrate	14797-55-8	1.3E+04	N	3.3E+05	N	2.0E+04	L1	1.0E+01	MCL
Nitrite	14797-65-0	7.8E+02	N	2.0E+04	N	2.0E+03	L1	1.0E+00	MCL
Nitroaniline,2-	88-74-4	1.7E+00	Q	1.7E+00	Q	1.7E+00	Q	5.0E-02	Q
Nitroaniline,3-	99-09-2	1.3E+01	N	1.4E+02	N	1.7E+00	Q	5.0E-02	Q
Nitroaniline,4-	100-01-6	1.0E+01	N	1.0E+02	N	1.7E+00	Q	5.0E-02	Q
Nitrobenzene	98-95-3	2.2E+00	N	2.5E+01	N	3.3E-01	Q	1.9E-03	Q
Nitrophenol,4-	100-02-7	3.2E+01	N	3.3E+02	N	2.6E+00	A	5.0E-02	Q
Nitrosodi-n-propylamine,n-	621-64-7	3.3E-01	Q	3.3E-01	Q	3.3E-01	Q	1.0E-02	Q
N-nitrosodiphenylamine	86-30-6	9.0E+01	C	4.0E+02	C	2.1E+00	A	1.4E-02	C
Pentachlorophenol	87-86-5	2.8E+00	C	9.7E+00	C	1.7E+00	Q	1.0E-03	MCL
Phenanthrene	85-01-8	2.1E+03	N	4.3E+04	N	6.6E+02	A	1.8E-01	N
Phenol	108-95-2	1.3E+03	N	1.5E+04	N	1.1E+01	A	1.8E-01	N

NOTE: See end of Table for designation of letter symbols

LDEQ RECAP TABLE 1
SCREENING OPTION
SCREENING STANDARDS FOR SOIL AND GROUNDWATER

		SOIL_SSni		SOIL_SSi		SOIL_SSGW		GW_SS	
COMPOUND	CAS #	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/L)	NOTE
Polychlorinated biphenyls	1336-36-3	1.1E-01	N	9.0E-01	C	1.9E+01	A	5.0E-04	MCL
Pyrene	129-00-0	2.3E+02	N	5.6E+03	N	1.1E+03	A	1.8E-02	N
Selenium	7782-49-2	3.9E+01	N	1.0E+03	N	2.0E+01	L	5.0E-02	MCL
Silver	7440-22-4	3.9E+01	N	1.0E+03	N	1.0E+02	L	1.8E-02	N
Styrene	100-42-5	5.0E+02	N	1.7E+03	P	1.1E+01	A	1.0E-01	MCL
Tetrachlorobenzene,1,2,4,5-	95-94-3	1.2E+00	N	1.2E+01	N	6.9E+00	A	1.1E-03	N
Tetrachloroethane,1,1,1,2-	630-20-6	2.7E+00	C	5.9E+00	C	4.6E-02	A	5.0E-03	Q
Tetrachloroethane,1,1,2,2-	79-34-5	8.1E-01	C	2.0E+00	C	6.0E-03	A	5.0E-04	Q
Tetrachloroethylene	127-18-4	8.3E+00	C	3.5E+01	C	1.8E-01	A	5.0E-03	MCL
Tetrachlorophenol,2,3,4,6-	58-90-2	1.4E+02	N	1.4E+03	P	3.1E+01	A	1.1E-01	N
Thallium	7440-28-0	5.5E-01	N	1.4E+01	N	4.0E+00	L1	2.0E-03	MCL
Toluene	108-88-3	6.8E+01	N	4.7E+02	N	2.0E+01	A	1.0E+00	MCL
Toxaphene	8001-35-2	4.4E-01	C	2.2E+00	C	3.4E+01	A	3.0E-03	MCL
Trichlorobenzene,1,2,4-	120-82-1	6.6E+01	N	1.2E+03	N	1.4E+01	A	7.0E-02	MCL
Trichloroethane,1,1,1-	71-55-6	8.2E+01	N	7.0E+02	N	4.0E+00	A	2.0E-01	MCL
Trichloroethane,1,1,2-	79-00-5	1.9E+00	C	4.3E+00	C	5.8E-02	A	5.0E-03	MCL
Trichloroethene	79-01-6	1.0E-01	C	2.1E-01	C	7.3E-02	A	5.0E-03	MCL
Trichlorofluoromethane	75-69-4	3.8E+01	N	2.6E+02	N	3.7E+01	A	1.3E-01	N
Trichlorophenol,2,4,5-	95-95-4	5.3E+02	N	6.6E+03	N	3.2E+02	A	3.7E-01	N
Trichlorophenol,2,4,6-	88-06-2	4.0E+01	C	1.7E+02	C	1.3E+00	A	1.0E-02	Q
Vanadium	7440-62-2	5.5E+01	N	1.4E+03	N	5.2E+02	L1	2.6E-02	N
Vinyl chloride	75-01-4	2.4E-01	C	7.9E-01	C	1.3E-02	A	2.0E-03	MCL
Xylene(mixed)	1330-20-7	1.8E+01	N	1.2E+02	N	1.5E+02	P	1.0E+01	MCL
Zinc	7440-66-6	2.3E+03	N	6.1E+04	N	2.8E+03	S	1.1E+00	N
Aliphatics C6-C8	NA	1.2E+03	N	8.0E+03	N	1.0E+04	O,T	3.2E+00	N
Aliphatics >C8-C10	NA	1.2E+02	N	8.8E+02	N	5.3E+03	A	1.5E-01	Q
Aliphatics >C10-C12	NA	2.3E+02	N	2.0E+03	N	1.0E+04	O,T	1.5E-01	Q
Aliphatics >C12-C16	NA	3.7E+02	N	3.8E+03	N	1.0E+04	O,T	1.5E-01	Q
Aliphatics >C16-C35	NA	7.1E+03	N	1.0E+04	O,T	1.0E+04	O,T	7.3E+00	N
Aromatics >C8-C10	NA	6.5E+01	N	5.1E+02	N	6.5E+01	A	1.5E-01	Q
Aromatics >C10-C12	NA	1.2E+02	N	1.1E+03	N	1.0E+02	A	1.5E-01	Q
Aromatics >C12-C16	NA	1.8E+02	N	2.1E+03	N	2.0E+02	A	1.5E-01	Q
Aromatics >C16-C21	NA	1.5E+02	N	1.7E+03	N	2.1E+03	A	1.5E-01	Q
Aromatics >C21-C35	NA	1.8E+02	N	2.5E+03	N	1.0E+04	O,T	1.5E-01	Q

NOTE: See end of Table for designation of letter symbols

LDEQ RECAP TABLE 1
SCREENING OPTION
SCREENING STANDARDS FOR SOIL AND GROUNDWATER

		SOIL_SSni		SOIL_SSi		SOIL_SSGW		GW_SS	
COMPOUND	CAS #	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/kg)	NOTE	(mg/L)	NOTE
TPH-GRO	NA	6.5E+01	N,I	5.1E+02	N,I	6.5E+01	A	1.5E-01	Q
TPH-DRO	NA	6.5E+01	N,I	5.1E+02	N,I	6.5E+01	A	1.5E-01	Q
TPH-ORO	NA	1.8E+02	N,I	2.5E+03	N,I	1.0E+04	O,T	1.5E-01	Q
A - Based on algorithm contained in Appendix H									
B - Based on EPA's biokinetic and adult lead cleanup level models for lead									
C - Based on carcinogenic health effects									
D - DEQ established background level plus one standard deviation = 11.5									
I - TPH Standards are only applicable when used in conjunction with Standards for indicator compounds									
L - Soil level protective of groundwater for inorganic constituents based on leachability									
L1 - Soil level protective of groundwater for inorganic constituents based on GW 1 because TCLP value not listed									
M - Based on EPA's Maximum Contaminant Level (MCL) for drinking water									
N - Based on non-carcinogenic health effects									
O - Ceiling value based on aesthetic considerations									
P - Soil Saturation Limit is less than health based level thus default to soil saturation limit									
Q - Based on analytical quantitation limit									
S - Soil level protective of groundwater for inorganic constituents based on the maximum concentration for the									
beneficial use of sewage sludge									
T - TPH shall not exceed 10,000									
W - Solubility limit is less than health based limit thus default to solubility limit									
T/O - EPA taste/odor advisory value									

LDEQ RECAP TABLE 2
MANAGEMENT OPTION 1
STANDARDS FOR SOIL
(mg/kg)

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat	SOILesni*	SOILesi*
Acenaphthene	83-32-9	3.7E+03	N	6.1E+04	N	2.2E+02	A	2.2E+02	X DF 2	2.5E+02	X DF3	3.2E+02	X DF 3	NA	7.3E+04	2.5E+05
Acenaphthylene	208-96-8	3.5E+03	N	5.1E+04	N	8.8E+01	A	8.8E+01	X DF 2	1.4E+02	X DF3	1.9E+02	X DF 3	NA	3.8E+04	1.3E+05
Acetone	67-64-1	1.7E+03	N	1.4E+04	N	1.5E+00	A	1.5E+00	X DF 2	8.5E+00	X DF3	1.8E+02	X DF 3	1.3E+05	6.6E+02	2.3E+03
Aldrin	309-00-2	2.8E-02	C	1.3E-01	C	1.1E+01	A	1.1E+01	F	1.1E+01	H	1.1E+01	H	NA		
Aniline	62-53-3	2.4E+01	N	1.7E+02	N	6.5E-02	A	6.5E-02	X DF 2	3.2E-02	X DF3	4.4E-01	X DF 3	1.0E+04		
Anthracene	120-12-7	2.2E+04	N	4.8E+05	N	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA	1.0E+06	1.0E+06
Antimony	7440-36-0	3.1E+01	N	8.2E+02	N	1.2E+01	L1	1.2E+01	L1	1.2E+01	L1	1.2E+01	L1	NA		
Arsenic	7440-38-2	1.2E+01	D	1.2E+01	D	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA		
Barium	7440-39-3	5.5E+03	N	1.4E+05	N	2.0E+03	L	2.0E+03	L	2.0E+03	L	2.0E+03	L	NA		
Benzene	71-43-2	1.5E+00	C	3.1E+00	C	5.1E-02	A	5.1E-02	X DF 2	1.1E-02	X DF3	1.3E-01	X DF 3	9.0E+02	1.0E+00	2.5E+00
Benz(a)anthracene	56-55-3	6.2E-01	C	2.9E+00	C	3.3E+02	A	3.9E+00	X DF 2	1.6E-02	X DF3	1.6E-02	X DF 3	NA		
Benzo(a)pyrene	50-32-8	3.3E-01	Q	3.3E-01	Q	2.3E+01	A	2.3E+01	X DF 2	2.3E+01	X DF3	2.3E+01	X DF 3	NA		
Benzo(b)fluoranthene	205-99-2	6.2E-01	C	2.9E+00	C	2.2E+02	A	1.3E+01	X DF 2	1.3E+01	G	1.3E+01	G	NA		
Benzo(k)fluoranthene	207-08-9	6.2E+00	C	2.9E+01	C	1.2E+02	A	1.2E+02	X DF 2	1.2E+02	G	1.2E+02	G	NA		
Beryllium	7440-41-7	1.6E+02	N	4.1E+03	N	8.0E+00	L1	8.0E+00	L1	8.0E+00	L1	8.0E+00	L1	NA		
Biphenyl,1,1-	92-52-4	2.9E+03	N	4.4E+04	N	1.9E+02	A	1.9E+02	X DF 2	1.4E+02	X DF3	1.7E+02	X DF 3	2.3E+02	4.6E+03	1.1E+04
Bis(2-chloroethyl)ether	111-44-4	3.3E-01	Q	1.1E+00	C	3.3E-01	Q	6.6E-02	F	3.3E-01	Q	2.4E-03	X DF 3	9.8E+03	7.6E+00	1.9E+01
Bis(2-chloroisopropyl)ether	108-60-1	4.9E+00	C	1.7E+01	C	8.0E-01	Q	2.7E-03	X DF 2	3.1E-03	X DF3	8.2E-03	X DF 3	8.4E+02	1.0E+00	5.5E+00
Bis(2-ethyl-hexyl)phthalate	117-81-7	3.5E+01	C	1.7E+02	C	7.9E+01	A	7.9E+01	X DF 2	7.9E+01	X DF3	7.9E+01	X DF 3	2.2E+02		
Bromodichloromethane	75-27-4	1.8E+00	C	4.2E+00	C	9.2E-01	A	9.2E-01	X DF 2	9.2E-01	G	3.0E-02	X DF 3	3.1E+03	8.2E-02	4.3E-01
Bromoform	75-25-2	4.8E+01	C	1.8E+02	C	1.8E+00	A	1.8E+00	X DF 2	6.9E-02	X DF3	6.1E-01	X DF 3	2.7E+03	1.4E+01	7.4E+01
Bromomethane	74-83-9	4.3E+00	N	3.0E+01	N	4.0E-02	A	3.5E-02	X DF 2	1.8E-01	X DF3	2.1E+00	X DF 3	3.0E+03	1.9E-01	6.4E-01
Butyl benzyl phthalate	85-68-7	1.2E+04	N	1.7E+05	N	4.4E+03	A	4.4E+03	X DF 2	1.5E+03	X DF3	1.7E+03	X DF 3	2.2E+02		
Cadmium	7440-43-9	3.9E+01	N	1.0E+03	N	2.0E+01	L	2.0E+01	L	2.0E+01	L	2.0E+01	L	NA		
Carbon Disulfide	75-15-0	3.6E+02	N	2.5E+03	N	1.1E+01	A	1.1E+01	X DF 2	2.9E+01	X DF3	1.5E+02	X DF 3	6.0E+02	9.2E-01	2.3E+00
Carbon Tetrachloride	56-23-5	5.3E-01	C	1.1E+00	C	1.1E-01	A	1.1E-01	X DF 2	5.0E-03	X DF3	2.7E-02	X DF 3	9.1E+02	2.6E-01	6.4E-01
Chlordane	57-74-9	1.6E+00	C	1.0E+01	C	1.2E+01	A	1.2E+01	X DF 2	1.2E+01	G	1.2E+01	G	NA		
Chloroaniline,p-	106-47-8	1.6E+02	N	1.7E+03	N	1.5E+00	A	1.5E+00	X DF 2	1.2E+00	X DF3	7.0E+00	X DF 3	NA		
Chlorobenzene	108-90-7	1.7E+02	N	1.2E+03	N	3.0E+00	A	3.0E+00	X DF 2	3.0E+00	X DF3	2.1E+01	X DF 3	7.0E+02	4.8E+02	1.2E+03
Chlorodibromomethane	124-48-1	2.2E+00	C	5.4E+00	C	1.0E+00	A	1.0E+00	X DF 2	3.9E-03	X DF3	5.1E-02	X DF 3	1.3E+03	2.0E-01	1.1E+00
Chloroethane (Ethylchloride)	75-00-3	4.1E+00	C	8.2E+00	C	3.5E-02	A	1.3E-02	X DF 2	4.4E+01	X DF3	4.3E+02	X DF 3	9.9E+02	3.7E+02	9.1E+02
Chloroform	67-66-3	4.4E-01	N	1.2E+00	C	9.0E-01	A	9.0E-01	X DF 2	4.8E-02	X DF3	6.3E-01	X DF 3	3.6E+03	4.1E-01	1.0E+00
Chloromethane	74-87-3	3.5E+00	C	7.3E+00	C	1.0E-01	Q	9.1E-03	X DF 2	1.5E-02	X DF3	2.2E-01	X DF 3	1.6E+03	1.2E+00	3.0E+00
Chloronaphthalene,2-	91-58-7	5.0E+03	N	8.3E+04	N	5.0E+02	A	5.0E+02	X DF 2	3.3E+02	X DF3	3.7E+02	X DF 3	NA	1.1E+05	3.6E+05
Chlorophenol,2-	95-57-8	1.5E+02	N	1.4E+03	N	1.4E+00	A	1.4E+00	X DF 2	4.6E-03	X DF3	5.8E+00	X DF 3	5.1E+04	1.7E+02	5.7E+02

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE 2
MANAGEMENT OPTION 1
STANDARDS FOR SOIL
(mg/kg)

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat	SOILesni*	SOILesi*
Chromium(III)	16065-83-1	1.2E+05	N	1.0E+06	O	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA		
Chromium(VI)	18540-29-97	2.3E+02	N	6.1E+03	N	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA		
Chrysene	218-01-9	6.2E+01	C	2.9E+02	C	7.6E+01	A	7.6E+01	X DF 2	1.8E+00	X DF3	1.8E+00	X DF 3	NA		
Cobalt	7440-48-4	4.7E+03	N	1.2E+05	N	4.4E+03	L1	4.4E+03	L1	4.4E+03	L1	4.4E+03	L1	NA		
Copper	7440-50-8	3.1E+03	N	8.2E+04	N	1.5E+03	S	1.5E+03	S	1.5E+03	S	1.5E+03	S	NA		
Cyanide (free)	57-12-5	1.5E+03	N	3.6E+04	N	4.0E+02	L1	4.0E+02	L1	4.0E+02	L1	4.0E+02	L1	NA		
DDD	72-54-8	2.4E+00	C	1.6E+01	C	1.5E+00	A	1.5E+00	X DF 2	1.5E+00	G	1.5E+00	G	NA		
DDE	72-55-9	1.7E+00	C	1.1E+01	C	2.0E+00	A	2.0E+00	X DF 2	2.0E+00	G	2.0E+00	G	NA		
DDT	50-29-3	1.7E+00	C	1.2E+01	C	2.4E+01	A	1.6E+01	X DF 2	1.6E+01	G	1.6E+01	G	NA		
Dibenz(a,h)anthracene	53-70-3	3.3E-01	Q	3.3E-01	Q	5.4E+02	A	2.0E+00	X DF 2	2.0E+00	G	2.0E+00	G	NA		
Dibenzofuran	132-64-9	2.9E+02	N	6.5E+03	N	2.4E+01	A	2.4E+01	X DF 2	1.3E+01	X DF3	1.5E+01	X DF 3	1.5E+02	7.1E+04	2.4E+05
Dibromo-3-chloropropane,1,2-	96-12-8	3.5E-01	C	1.8E+00	C	1.0E-02	Q	2.6E-03	X DF 2	2.6E-03	X DF3	2.6E-03	X DF 3	7.8E+02		
Dichlorobenzene,1,2-	95-50-1	9.9E+02	N	7.4E+03	N	2.9E+01	A	2.9E+01	X DF 2	2.9E+01	X DF3	1.6E+02	X DF 3	3.8E+02	3.1E+02	1.1E+03
Dichlorobenzene,1,3-	541-73-1	2.1E+01	N	1.8E+02	N	2.1E+00	A	1.1E+00	X DF 2	3.8E+00	X DF3	9.2E+00	X DF 3	1.3E+03	1.3E+01	4.4E+01
Dichlorobenzene,1,4-	106-46-7	6.7E+00	C	1.6E+01	C	5.7E+00	A	5.7E+00	X DF 2	5.7E+00	X DF3	5.7E+00	X DF 3	NA	2.6E+03	6.5E+03
Dichlorobenzidine,3,3-	91-94-1	9.7E-01	C	4.2E+00	C	1.8E+00	A	1.3E-02	X DF 2	1.1E-03	X DF3	1.4E-03	X DF 3	NA		
Dichloroethane,1,1-	75-34-3	6.6E+02	N	4.7E+03	N	7.5E+00	A	7.5E+00	X DF 2	2.7E+01	X DF3	1.8E+02	X DF 3	2.3E+03	4.7E+01	1.6E+02
Dichloroethane,1,2-	107-06-2	8.2E-01	C	1.8E+00	C	3.5E-02	A	3.5E-02	X DF 2	2.6E-03	X DF3	4.8E-02	X DF 3	3.0E+03	1.1E+00	2.6E+00
Dichloroethene,1,1-	75-35-4	1.3E+02	N	9.1E+02	N	8.5E-02	A	8.5E-02	X DF 2	6.1E-04	X DF3	7.0E-03	X DF 3	1.4E+03	4.3E+00	1.5E+01
Dichloroethene,cis,1,2-	156-59-2	4.8E+01	N	3.4E+02	N	4.9E-01	A	4.9E-01	X DF 2	4.9E-01	X DF3	1.2E+01	X DF 3	1.2E+03	3.4E+00	1.2E+01
Dichloroethene,trans,1,2-	156-60-5	6.9E+01	N	4.8E+02	N	7.7E-01	A	7.7E-01	X DF 2	7.7E-01	X DF3	1.9E+01	X DF 3	2.4E+03	3.4E+00	1.2E+01
Dichlorophenol,2,4-	120-83-2	1.6E+02	N	2.0E+03	N	1.2E+01	A	1.2E+01	X DF 2	3.2E-02	X DF3	2.5E+01	X DF 3	NA		
Dichloropropane,1,2-	78-87-5	8.3E-01	C	1.8E+00	C	4.2E-02	A	4.2E-02	X DF 2	4.2E-02	X DF3	4.2E-02	X DF 3	1.2E+03	1.3E+03	3.1E+03
Dichloropropene,1,3-	542-75-6	3.1E+00	C	1.0E+01	C	4.0E-02	A	3.2E-03	X DF 2	8.0E-02	X DF3	1.3E+00	X DF 3	1.1E+03	3.1E+01	7.7E+01
Dieldrin	60-57-1	3.0E-02	C	1.5E-01	C	7.6E+00	A	7.6E+00	F	7.6E+00	H	7.6E+00	H	NA		
Diethylphthalate	84-66-2	3.6E+04	N	3.9E+05	N	3.6E+02	A	3.6E+02	X DF 2	1.6E+02	X DF3	2.8E+02	X DF 3	6.7E+02		
Dimethylphenol,2,4-	105-67-9	9.3E+02	N	1.1E+04	N	2.0E+01	A	2.0E+01	X DF 2	7.6E+00	X DF3	1.2E+01	X DF 3	NA		
Dimethylphthalate	131-11-3	4.2E+05	N	1.0E+06	O	2.8E+03	A	2.8E+03	X DF 2	1.6E+03	X DF3	4.3E+03	X DF 3	1.5E+03		
Di-n-octylphthalate	117-84-0	2.4E+03	N	3.5E+04	N	2.0E+05	A	2.0E+05	X DF 2	2.0E+05	X DF3	2.0E+05	X DF 3	1.0E+04		
Dinitrobenzene,1,3-	99-65-0	4.5E+00	N	5.0E+01	N	2.5E-01	Q	7.5E-02	X DF 2	6.4E-02	X DF3	5.7E-01	X DF 3	5.5E+02		
Dinitrophenol,2,4-	51-28-5	7.1E+01	N	6.9E+02	N	1.7E+00	Q	3.4E-01	X DF 2	2.8E-01	X DF3	2.3E+00	X DF 3	NA		
Dinitrotoluene,2,6-	606-20-2	4.3E+01	N	4.6E+02	N	3.9E-01	A	3.9E-01	X DF 2	3.1E-01	X DF3	1.8E+00	X DF 3	NA		
Dinitrotoluene,2,4-	121-14-2	8.9E+01	N	9.8E+02	N	1.0E+00	A	1.0E+00	X DF 2	7.9E-01	X DF3	4.1E+00	X DF 3	NA		
Dinoseb	88-85-7	4.7E+01	N	5.4E+02	N	1.4E-01	Q	1.2E-01	X DF 2	1.2E-01	X DF3	4.4E-01	X DF 3	NA		
Endosulfan	115-29-7	3.4E+02	N	4.5E+03	N	5.4E+01	A	5.4E+01	X DF 2	5.4E+01	G	1.6E-01	X DF 3	NA		

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LDEQ RECAP TABLE 2
MANAGEMENT OPTION 1
STANDARDS FOR SOIL
(mg/kg)

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat	SOILesni*	SOILesi*
Endrin	72-20-8	1.8E+01	N	2.5E+02	N	2.6E+00	A	2.6E+00	X DF 2	3.4E-01	X DF3	3.4E-01	X DF 3	NA		
Ethyl benzene	100-41-4	1.6E+03	N	1.3E+04	N	1.9E+01	A	1.9E+01	X DF 2	6.6E+01	X DF3	2.2E+02	X DF 3	2.3E+02	1.9E+03	4.8E+03
Fluoranthene	206-44-0	2.2E+03	N	2.9E+04	N	1.2E+03	A	1.2E+03	X DF 2	1.8E+02	X DF3	1.9E+02	X DF 3	NA		
Fluorene	86-73-7	2.8E+03	N	5.4E+04	N	2.3E+02	A	2.3E+02	X DF 2	6.8E+01	X DF3	7.2E+01	X DF 3	NA	1.9E+05	6.4E+05
Heptachlor	76-44-8	1.6E-02	C	3.5E-02	C	5.0E-01	A	5.0E-01	X DF 2	5.0E-01	G	5.0E-01	G	NA		
Heptachlor epoxide	1024-57-3	5.3E-02	C	2.6E-01	C	2.0E+00	A	2.0E+00	X DF 2	2.0E+00	X DF3	2.0E+00	X DF 3	NA		
Hexachlorobenzene	118-74-1	3.4E-01	C	2.0E+00	C	9.6E+00	A	9.6E+00	X DF 2	9.6E+00	G	9.6E+00	G	NA	1.1E+02	2.6E+02
Hexachlorobutadiene	87-68-3	4.5E+00	C	1.6E+01	C	5.5E+00	A	5.5E+00	X DF 2	5.8E-01	X DF3	7.1E-01	X DF 3	1.0E+03		
Hexachlorocyclohexane,alpha	319-84-6	8.2E-02	C	4.4E-01	C	6.4E-03	A	2.2E-03	X DF 2	3.7E-04	X DF3	5.5E-04	X DF 3	NA		
Hexachlorocyclohexane,beta	319-85-7	2.9E-01	C	1.6E+00	C	1.6E-02	A	9.5E-03	X DF 2	1.3E-03	X DF3	1.7E-03	X DF 3	NA		
Hexachlorocyclohexane,gamma	58-89-9	3.9E-01	C	2.0E+00	C	3.3E-02	A	3.3E-02	X DF 2	1.8E-02	X DF3	3.3E-02	X DF 3	NA		
Hexachlorocyclopentadiene	77-47-4	1.4E+01	N	9.4E+01	N	1.2E+03	A	1.2E+03	X DF 2	1.2E+03	X DF3	1.2E+03	X DF 3	2.2E+03	4.6E+01	1.6E+02
Hexachloroethane	67-72-1	3.2E+01	C	1.4E+02	C	2.2E+00	A	1.7E-01	X DF 2	2.2E-01	X DF3	3.8E-01	X DF 3	NA	2.1E+03	5.2E+03
Indeno(1,2,3-cd)pyrene	193-39-5	6.2E-01	C	2.9E+00	C	9.2E+00	A	9.2E+00	X DF 2	9.2E+00	G	9.2E+00	G	NA		
Isobutyl alcohol	78-83-1	7.3E+03	N	6.2E+04	N	3.0E+01	A	3.0E+01	X DF 2	2.7E+01	X DF3	4.3E+02	X DF 3	1.2E+04		
Isophorone	78-59-1	3.4E+02	C	1.1E+03	C	5.6E-01	A	5.6E-01	X DF 2	2.7E-01	X DF3	2.6E+00	X DF 3	4.9E+03		
Lead (inorganic)	7439-92-1	4.0E+02	B	1.4E+03	B	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA		
Mercury (inorganic)	7487-94-7	2.3E+01	N	6.1E+02	N	4.0E+00	L	4.0E+00	L	4.0E+00	L	4.0E+00	L	NA		
Methoxychlor	72-43-5	3.0E+02	N	4.3E+03	N	3.8E+02	A	3.8E+02	X DF 2	3.8E+02	X DF3	3.8E+02	X DF 3	NA		
Methylene chloride	75-09-2	1.9E+01	C	4.4E+01	C	1.7E-02	A	1.7E-02	X DF 2	1.5E-02	X DF3	2.9E-01	X DF 3	2.2E+03	1.3E+01	3.2E+01
Methyl ethyl ketone	78-93-3	5.9E+03	N	4.4E+04	N	5.0E+00	A	5.0E+00	X DF 2	5.2E+01	X DF3	1.0E+03	X DF 3	2.9E+04	2.8E+04	6.9E+04
Methyl isobutyl ketone	108-10-1	4.5E+03	N	6.3E+04	N	6.4E+00	A	6.4E+00	X DF 2	8.3E+00	X DF3	9.7E+01	X DF 3	3.1E+03	5.7E+03	1.4E+04
Methylnaphthalene,2-	91-57-6	2.2E+02	N	1.7E+03	N	1.7E+00	A	1.7E+00	X DF 2	7.0E+00	X DF3	7.3E+00	X DF 3	NA	1.0E+03	3.5E+03
MTBE (methyl tert-butyl ether)	1634-04-4	6.5E+03	N	4.7E+04	N	7.7E-02	A	7.7E-02	X DF 2	7.7E-02	X DF3	2.1E+03	X DF 3	9.8E+03	8.0E+02	2.8E+03
Naphthalene	91-20-3	6.2E+01	N	4.3E+02	N	1.5E+00	A	9.0E-01	X DF 2	2.5E+01	X DF3	3.2E+01	X DF 3	NA	6.3E+01	2.2E+02
Nickel	7440-02-0	1.6E+03	N	4.1E+04	N	1.5E+03	L1	1.5E+03	L1	1.5E+03	L1	1.5E+03	L1	NA		
Nitrate	14797-55-8	1.3E+05	N	1.0E+06	O	2.0E+04	L1	2.0E+04	L1	2.0E+04	L1	2.0E+04	L1	NA		
Nitrite	14797-65-0	7.8E+03	N	2.0E+05	N	2.0E+03	L1	2.0E+03	L1	2.0E+03	L1	2.0E+03	L1	NA		
Nitroaniline,2-	88-74-4	1.7E+00	Q	5.2E+00	N	1.7E+00	Q	1.7E+00	Q	3.9E-01	X DF3	2.3E+00	X DF 3	2.8E+02	2.8E-01	9.5E-01
Nitroaniline,3-	99-09-2	1.3E+02	N	1.4E+03	N	1.7E+00	Q	8.5E-02	X DF 2	4.4E-01	X DF3	4.3E+00	X DF 3	2.8E+02	3.5E+02	1.2E+03
Nitroaniline,4-	100-01-6	1.0E+02	N	1.0E+03	N	1.7E+00	Q	4.3E-01	X DF 2	3.7E-01	X DF3	3.6E+00	X DF 3	1.4E+02		
Nitrobenzene	98-95-3	2.2E+01	N	2.5E+02	N	3.3E-01	Q	5.7E-02	X DF 2	2.5E-01	X DF3	1.6E+00	X DF 3	1.8E+03	3.2E+03	7.9E+03
Nitrophenol,4-	100-02-7	3.2E+02	N	3.3E+03	N	2.6E+00	A	2.6E+00	X DF 2	2.1E+00	X DF3	1.2E+01	X DF 3	5.4E+03		
Nitrosodi-n-propylamine,n-	621-64-7	3.3E-01	Q	3.3E-01	Q	3.3E-01	Q	5.3E-02	F	5.3E-02	H	3.3E-01	Q	NA		
N-nitrosodiphenylamine	86-30-6	9.0E+01	C	4.0E+02	C	2.1E+00	A	2.1E+00	X DF 2	3.5E-01	X DF3	5.1E-01	X DF 3	NA		

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE 2
MANAGEMENT OPTION 1
STANDARDS FOR SOIL
(mg/kg)

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat	SOILesni*	SOILesi*
Pentachlorophenol	87-86-5	2.8E+00	C	9.7E+00	C	1.7E+00	Q	1.1E-01	X DF 2	1.1E-01	X DF3	1.1E-01	X DF 3	NA		
Phenanthrene	85-01-8	2.1E+04	N	4.3E+05	N	6.6E+02	A	6.6E+02	X DF 2	1.2E+02	X DF3	1.2E+02	X DF 3	NA	1.0E+06	1.0E+06
Phenol	108-95-2	1.3E+04	N	1.5E+05	N	1.1E+01	A	1.1E+01	X DF 2	5.5E+01	X DF3	4.9E+02	X DF 3	NA	3.5E+04	1.2E+05
Polychlorinated biphenyls	1336-36-3	2.1E-01	C	9.0E-01	C	1.9E+01	A	1.9E+01	X DF 2	1.9E+01	G	1.9E+01	G	5.7E+01		
Pyrene	129-00-0	2.3E+03	N	5.6E+04	N	1.1E+03	A	1.1E+03	X DF 2	1.1E+03	X DF3	1.1E+03	X DF 3	NA	1.0E+06	1.0E+06
Selenium	7782-49-2	3.9E+02	N	1.0E+04	N	2.0E+01	L	2.0E+01	L	2.0E+01	L	2.0E+01	L	NA		
Silver	7440-22-4	3.9E+02	N	1.0E+04	N	1.0E+02	L	1.0E+02	L	1.0E+02	L	1.0E+02	L	NA		
Styrene	100-42-5	5.0E+03	N	4.3E+04	N	1.1E+01	A	1.1E+01	X DF 2	1.1E+01	X DF3	7.9E+02	X DF 3	1.7E+03	2.3E+03	5.7E+03
Tetrachlorobenzene,1,2,4,5-	95-94-3	1.2E+01	N	1.2E+02	N	6.9E+00	A	6.9E+00	X DF 2	3.4E-01	X DF3	3.6E-01	X DF 3	1.9E+01		
Tetrachloroethane,1,1,1,2-	630-20-6	2.7E+00	C	5.9E+00	C	4.6E-02	A	3.9E-03	X DF 2	7.7E-03	X DF3	2.0E-02	X DF 3	5.0E+02	2.5E-02	6.3E-02
Tetrachloroethane,1,1,2,2-	79-34-5	8.1E-01	C	2.0E+00	C	6.0E-03	A	6.5E-04	X DF 2	1.9E-03	X DF3	2.2E-02	X DF 3	1.8E+03	3.3E+00	8.0E+00
Tetrachloroethylene	127-18-4	8.3E+00	C	3.5E+01	C	1.8E-01	A	1.8E-01	X DF 2	2.3E-02	X DF3	8.9E-02	X DF 3	3.6E+02	1.2E+01	2.9E+01
Tetrachlorophenol,2,3,4,6-	58-90-2	1.4E+03	N	1.7E+04	N	3.1E+01	A	3.1E+01	X DF 2	4.2E+00	X DF3	5.0E+00	X DF 3	1.4E+03		
Thallium	7440-28-0	5.5E+00	N	1.4E+02	N	4.0E+00	L1	4.0E+00	L1	4.0E+00	L1	4.0E+00	L1	NA		
Toluene	108-88-3	6.8E+02	N	4.7E+03	N	2.0E+01	A	2.0E+01	X DF 2	1.2E+02	X DF3	9.1E+02	X DF 3	5.2E+02	5.5E+01	1.4E+02
Toxaphene	8001-35-2	4.4E-01	C	2.2E+00	C	3.4E+01	A	3.4E+01	X DF 2	3.4E+01	G	3.4E+01	G	NA		
Trichlorobenzene,1,2,4-	120-82-1	6.6E+02	N	1.2E+04	N	1.4E+01	A	1.4E+01	X DF 2	1.4E+01	X DF3	3.8E+01	X DF 3	NA	3.9E+03	1.3E+04
Trichloroethane,1,1,1-	71-55-6	8.2E+02	N	7.0E+03	N	4.0E+00	A	4.0E+00	X DF 2	4.0E+00	X DF3	1.8E+02	X DF 3	1.3E+03	6.2E+01	2.1E+02
Trichloroethane,1,1,2-	79-00-5	1.9E+00	C	4.3E+00	C	5.8E-02	A	5.8E-02	X DF 2	6.5E-03	X DF3	8.0E-02	X DF 3	2.5E+03	4.1E+00	1.0E+01
Trichloroethene	79-01-6	1.0E-01	C	2.1E-01	C	7.3E-02	A	7.3E-02	X DF 2	4.1E-02	X DF3	3.0E-01	X DF 3	8.0E+02	4.2E+00	1.0E+01
Trichlorofluoromethane	75-69-4	3.8E+02	N	2.6E+03	N	3.7E+01	A	3.7E+01	X DF 2	2.0E+02	X DF3	5.8E+02	X DF 3	1.6E+03	9.9E+00	3.4E+01
Trichlorophenol,2,4,5-	95-95-4	5.3E+03	N	6.6E+04	N	3.2E+02	A	3.2E+02	X DF 2	4.7E+01	X DF3	5.6E+01	X DF 3	NA		
Trichlorophenol,2,4,6-	88-06-2	4.0E+01	C	1.7E+02	C	1.3E+00	A	7.9E-01	X DF 2	8.6E-02	X DF3	1.1E-01	X DF 3	NA		
Vanadium	7440-62-2	5.5E+02	N	1.4E+04	N	5.2E+02	L1	5.2E+02	L1	5.2E+02	L1	5.2E+02	L1	NA		
Vinyl chloride	75-01-4	2.4E-01	C	7.9E-01	C	1.3E-02	A	1.3E-02	X DF 2	1.3E-02	X DF3	2.4E-01	X DF 3	9.2E+02	1.1E-02	2.8E-02
Xylene(mixed)	1330-20-7	1.8E+02	N	1.2E+03	N	1.8E+02	A	1.8E+02	X DF 2	1.8E+02	X DF3	1.8E+02	X DF 3	1.5E+02	1.5E+01	5.1E+01
Zinc	7440-66-6	2.3E+04	N	6.1E+05	N	2.8E+03	S	2.8E+03	S	2.8E+03	S	2.8E+03	S	NA		
Aliphatics C6-C8	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA	3.6E+02	8.9E+02
Aliphatics >C8-C10	NA	1.2E+03	N	8.8E+03	N	5.3E+03	A	5.3E+03	X DF2	1.0E+04	O,T	1.0E+04	O,T	NA	8.6E+01	2.1E+02
Aliphatics >C10-C12	NA	2.3E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA	4.6E+02	1.1E+03
Aliphatics >C12-C16	NA	3.7E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA	2.1E+03	5.2E+03
Aliphatics >C16-C35	NA	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA		
Aromatics >C8-C10	NA	6.5E+02	N	5.1E+03	N	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF3	NA	1.5E+02	3.6E+02
Aromatics >C10-C12	NA	1.2E+03	N	1.0E+04	O,T	1.0E+02	A	1.0E+02	X DF2	4.1E+02	X DF3	9.6E+03	X DF3	NA	7.8E+02	1.9E+03
Aromatics >C12-C16	NA	1.8E+03	N	1.0E+04	O,T	2.0E+02	A	2.0E+02	X DF2	8.1E+02	X DF3	1.0E+04	O,T	NA	4.1E+03	1.0E+04

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE 2
MANAGEMENT OPTION 1
STANDARDS FOR SOIL
(mg/kg)

COMPOUND	CAS #	SOILni	NOTE	SOILi	NOTE	SOILGW1	NOTE	SOILGW2	NOTE	SOILGW3DW	NOTE	SOILGW3NDW	NOTE	SOILsat	SOILesni*	SOILesi*
Aromatics >C16-C21	NA	1.5E+03	N	1.0E+04	O,T	2.1E+03	A	2.1E+03	X DF2	1.9E+03	X DF3	1.0E+04	O,T	NA		
Aromatics >C21-C35	NA	1.8E+03	N	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA		
TPH-GRO	NA	6.5E+02	N,I	5.1E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF3	NA	8.6E+01	2.1E+02
TPH-DRO	NA	6.5E+02	N,I	5.1E+03	N,I	6.5E+01	A	6.5E+01	X DF2	2.6E+02	X DF3	6.1E+03	X DF3	NA		
TPH-ORO	NA	1.8E+03	N,I	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	1.0E+04	O,T	NA		
A - Based on algorithm contained in Appendix H																
B - Based on EPA's biokinetic and adult lead cleanup level models for lead																
C - Based on carcinogenic health effects																
D - DEQ established background level plus one standard deviation = 11.5																
F - GW 2 soil water partition equation multiplied by maximum DF is less than SoilGW1 thus default to SoilGW 1																
G - GW 3 soil water partition equation multiplied by maximum DF is less than SoilGW2 thus default to SoilGW 2 and multiply by X DF 2																
H - GW 3 soil water partition equation multiplied by maximum DF is less than SoilGW2 thus default to GW 2 and do not multiply by DF 2																
I - TPH Standards are only applicable when used in conjunction with Standards for indicator compounds																
L - Soil level protective of groundwater for inorganic constituents based on leachability (TCLP listed)																
L1 - Soil level protective of groundwater for inorganic constituents based on GW 1 because TCLP value not listed																
N - Based on non-carcinogenic health effects																
NA - Not applicable																
O - Ceiling value based on aesthetic considerations																
Q - Based on analytical quantitation limit																
S - Soil level protective of groundwater for inorganic constituents based on the maximum concentration for the beneficial use of sewage sludge																
T - TPH shall not exceed 10,000																
X DF 2 - Multiply SOILGW2 by the appropriate site specific DF from the chart																
X DF 3 - Multiply SOILGW3DW or SOILGW3NDW by the appropriate site specific DF from the chart																
* The MO-1 SOILes is presented for screening purposes only; if the soil AOIC exceeds the MO-1 SOILes, then further assessment maybe warranted under MO-2 or MO-3.																

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE 3
MANAGEMENT OPTION 1, 2, AND 3
STANDARDS FOR GROUNDWATER
(mg/l)

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S	Gwesni*	Gwesi*	Gwairni*	Gwairi*
Acenaphthene	83-32-9	3.7E-01	N	3.7E-01	X DF 2	4.3E-01	X DF 3	5.4E-01	X DF 3	4.2E+00	2.8E+03	9.6E+03	1.7E+05	2.4E+05
Acenaphthylene	208-96-8	3.7E-01	N	3.7E-01	X DF 2	5.6E-01	X DF 3	7.7E-01	X DF 3	1.6E+01	3.6E+03	1.2E+04	2.1E+05	3.0E+05
Acetone	67-64-1	6.1E-01	N	6.1E-01	X DF 2	3.3E+00	X DF 3	7.2E+01	X DF 3	1.0E+06	5.8E+03	2.0E+04	3.5E+05	4.8E+05
Aldrin	309-00-2	1.9E-03	Q	1.9E-03	F	1.9E-03	G	1.9E-03	G	1.8E-01				
Aniline	62-53-3	1.2E-02	C	1.2E-02	X DF 2	5.7E-03	X DF 3	8.0E-02	X DF 3	3.6E+04				
Anthracene	120-12-7	1.8E+00	N	1.8E+00	X DF 2	1.1E-01	X DF 3	1.1E-01	X DF 3	4.3E-02	3.7E+04	1.3E+05	1.0E+06	1.0E+06
Antimony	7440-36-0	6.0E-03	MCL	6.0E-03	X DF 2	6.0E-03	X DF 3	2.6E-01	X DF 3	NA				
Arsenic	7440-38-2	1.0E-02	MCL	1.0E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA				
Barium	7440-39-3	2.0E+00	MCL	2.0E+00	X DF 2	2.0E+00	X DF 3	4.5E+01	X DF 3	NA				
Benzene	71-43-2	5.0E-03	MCL	5.0E-03	X DF 2	1.1E-03	X DF 3	1.3E-02	X DF 3	1.8E+03	2.9E+00	7.2E+00	3.9E+02	3.9E+02
Benz(a)anthracene	56-55-3	7.8E-03	Q	9.1E-05	X DF 2	3.8E-07	X DF 3	3.8E-07	X DF 3	9.4E-03				
Benzo(a)pyrene	50-32-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.6E-03				
Benzo(b)fluoranthene	205-99-2	4.8E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	1.5E-03				
Benzo(k)fluoranthene	207-08-9	2.5E-03	Q	9.1E-04	X DF 2	9.1E-04	H	9.1E-04	H	8.0E-04				
Beryllium	7440-41-7	4.0E-03	MCL	4.0E-03	X DF 2	4.0E-03	X DF 3	3.0E-01	X DF 3	NA				
Biphenyl,1,1-	92-52-4	3.0E-01	N	3.0E-01	X DF 2	2.3E-01	X DF 3	2.7E-01	X DF 3	7.5E+00	1.7E+02	4.2E+02	1.1E+04	1.1E+04
Bis(2-chloroethyl)ether	111-44-4	5.7E-03	Q	5.7E-03	F	2.8E-05	X DF 3	2.1E-04	X DF 3	1.7E+04	1.5E+01	3.7E+01	8.8E+02	8.8E+02
Bis(2-chloroisopropyl)ether	108-60-1	5.7E-03	Q	2.7E-04	X DF 2	3.1E-04	X DF 3	8.3E-04	X DF 3	1.7E+03	2.4E+00	1.3E+01	1.4E+02	3.1E+02
Bis(2-ethyl-hexyl)phthalate	117-81-7	6.0E-03	MCL	6.0E-03	X DF 2	6.0E-03	X DF 3	6.0E-03	X DF 3	3.4E-01				
Bromodichloromethane	75-27-4	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	H	3.3E-03	X DF 3	6.7E+03	2.1E-01	1.1E+00	1.4E+01	3.0E+01
Bromoform	75-25-2	1.0E-01	MCL	1.0E-01	X DF 2	3.9E-03	X DF 3	3.5E-02	X DF 3	3.1E+03	1.8E+01	9.5E+01	1.1E+03	2.3E+03
Bromomethane	74-83-9	1.0E-02	Q	8.7E-03	X DF 2	4.5E-02	X DF 3	5.3E-01	X DF 3	1.5E+04	1.3E+00	4.5E+00	1.5E+02	2.1E+02
Butyl benzyl phthalate	85-68-7	7.3E+00	N	7.3E+00	X DF 2	9.1E-01	X DF 3	1.0E+00	X DF 3	2.7E+00				
Cadmium	7440-43-9	5.0E-03	MCL	5.0E-03	X DF 2	1.0E-02	X DF 3	1.0E-02	X DF 3	NA				
Carbon Disulfide	75-15-0	1.0E+00	N	1.0E+00	X DF 2	2.8E+00	X DF 3	1.5E+01	X DF 3	1.2E+03	5.3E+00	1.3E+01	1.3E+03	1.3E+03
Carbon Tetrachloride	56-23-5	5.0E-03	MCL	5.0E-03	X DF 2	2.2E-04	X DF 3	1.2E-03	X DF 3	7.9E+02	6.1E-01	1.5E+00	1.4E+02	1.4E+02
Chlordane	57-74-9	2.0E-03	MCL	2.0E-03	X DF 2	2.0E-03	H	2.0E-03	H	5.6E-02				
Chloroaniline,p-	106-47-8	1.5E-01	N	1.5E-01	X DF 2	1.2E-01	X DF 3	6.7E-01	X DF 3	5.3E+03				
Chlorobenzene	108-90-7	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	X DF 3	7.1E-01	X DF 3	4.7E+02	4.4E+02	1.1E+03	4.9E+04	4.9E+04
Chlorodibromomethane	124-48-1	1.0E-01	MCL	1.0E-01	X DF 2	3.9E-04	X DF 3	5.1E-03	X DF 3	2.6E+03	4.5E-01	2.4E+00	2.8E+01	5.9E+01
Chloroethane (Ethylchloride)	75-00-3	1.0E-02	Q	3.8E-03	X DF 2	1.3E+01	X DF 3	1.2E+02	X DF 3	5.7E+03	5.1E+03	1.3E+04	1.1E+06	1.1E+06
Chloroform	67-66-3	1.0E-01	MCL	1.0E-01	X DF 2	5.3E-03	X DF 3	7.0E-02	X DF 3	7.9E+03	1.3E+00	3.1E+00	1.5E+02	1.5E+02
Chloromethane	74-87-3	1.0E-02	Q	1.5E-03	X DF 2	2.5E-03	X DF 3	3.7E-02	X DF 3	5.3E+03	9.0E+00	2.2E+01	1.9E+03	1.9E+03
Chloronaphthalene,2-	91-58-7	4.9E-01	N	4.9E-01	X DF 2	3.2E-01	X DF 3	3.6E-01	X DF 3	1.2E+01	2.3E+03	8.0E+03	1.4E+05	2.0E+05
Chlorophenol,2-	95-57-8	3.0E-02	N	3.0E-02	X DF 2	1.0E-04	X DF 3	1.3E-01	X DF 3	2.2E+04	8.2E+01	2.8E+02	5.2E+03	7.2E+03

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE 3
MANAGEMENT OPTION 1, 2, AND 3
STANDARDS FOR GROUNDWATER
(mg/l)

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S	Gwesni*	Gwesi*	Gwairni*	Gwairi*
Chromium(III)	16065-83-1	1.0E-01	MCL	1.0E-01	X DF 2	5.0E-02	X DF 3	9.6E+02	X DF 3	NA				
Chromium(VI)	18540-29-97	1.0E-01	MCL	1.0E-01	X DF 2	5.0E-02	X DF 3	1.9E+00	X DF 3	NA				
Chrysene	218-01-9	9.1E-03	C	9.1E-03	X DF 2	3.8E-05	X DF 3	3.8E-05	X DF 3	1.6E-03				
Cobalt	7440-48-4	2.2E+00	N	2.2E+00	X DF 2	2.0E+00	X DF 3	3.9E+01	X DF 3	NA				
Copper	7440-50-8	1.3E+00	MCL	1.3E+00	X DF 2	1.0E+00	X DF 3	1.3E+00	X DF 3	NA				
Cyanide (free)	57-12-5	2.0E-01	MCL	2.0E-01	X DF 2	6.6E-01	X DF 3	1.3E+01	X DF 3	NA				
DDD	72-54-8	2.8E-04	C	2.8E-04	X DF 2	2.8E-04	H	2.8E-04	H	9.0E-02				
DDE	72-55-9	2.0E-04	C	2.0E-04	X DF 2	2.0E-04	H	2.0E-04	H	1.2E-01				
DDT	50-29-3	3.0E-04	Q	2.0E-04	X DF 2	2.0E-04	H	2.0E-04	H	2.5E-02				
Dibenz(a,h)anthracene	53-70-3	2.5E-03	Q	9.1E-06	X DF 2	9.1E-06	H	9.1E-06	H	2.5E-03				
Dibenzofuran	132-64-9	2.4E-02	N	2.4E-02	X DF 2	1.4E-02	X DF 3	1.5E-02	X DF 3	3.1E+00	1.6E+03	5.6E+03	9.6E+04	1.3E+05
Dibromo-3-chloropropane,1,2-	96-12-8	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	1.2E+03				
Dichlorobenzene,1,2-	95-50-1	6.0E-01	MCL	6.0E-01	X DF 2	6.0E-01	X DF 3	3.4E+00	X DF 3	1.6E+02	1.6E+02	5.5E+02	1.4E+04	2.0E+04
Dichlorobenzene,1,3-	541-73-1	1.0E-02	Q	5.5E-03	X DF 2	1.8E-02	X DF 3	4.5E-02	X DF 3	1.3E+02	1.7E+00	5.8E+00	1.8E+02	2.5E+02
Dichlorobenzene,1,4-	106-46-7	7.5E-02	MCL	7.5E-02	X DF 2	7.5E-02	X DF 3	7.5E-02	X DF 3	7.4E+01	8.8E+02	2.2E+03	8.4E+04	8.4E+04
Dichlorobenzidine,3,3-	91-94-1	2.0E-02	Q	1.5E-04	X DF 2	1.3E-05	X DF 3	1.5E-05	X DF 3	3.1E+00				
Dichloroethane,1,1-	75-34-3	8.1E-01	N	8.1E-01	X DF 2	3.0E+00	X DF 3	1.9E+01	X DF 3	5.1E+03	1.4E+02	4.9E+02	1.7E+04	2.4E+04
Dichloroethane,1,2-	107-06-2	5.0E-03	MCL	5.0E-03	X DF 2	3.6E-04	X DF 3	6.8E-03	X DF 3	8.5E+03	3.6E+00	8.9E+00	2.8E+02	2.8E+02
Dichloroethene,1,1-	75-35-4	7.0E-03	MCL	7.0E-03	X DF 2	5.0E-05	X DF 3	5.8E-04	X DF 3	2.3E+03	1.8E+01	6.2E+01	4.0E+03	5.6E+03
Dichloroethene,cis,1,2-	156-59-2	7.0E-02	MCL	7.0E-02	X DF 2	7.0E-02	X DF 3	1.7E+00	X DF 3	3.5E+03	1.3E+01	4.5E+01	1.3E+03	1.9E+03
Dichloroethene,trans,1,2-	156-60-5	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	X DF 3	2.5E+00	X DF 3	6.3E+03	1.4E+01	4.7E+01	1.9E+03	2.6E+03
Dichlorophenol,2,4-	120-83-2	1.1E-01	N	1.1E-01	X DF 2	3.0E-04	X DF 3	2.3E-01	X DF 3	4.5E+03				
Dichloropropane,1,2-	78-87-5	5.0E-03	MCL	5.0E-03	X DF 2	5.0E-03	X DF 3	5.0E-03	X DF 3	2.8E+03	4.0E+03	9.8E+03	4.0E+05	4.0E+05
Dichloropropene,1,3-	542-75-6	5.0E-03	Q	3.9E-04	X DF 2	9.9E-03	X DF 3	1.6E-01	X DF 3	2.8E+03	9.3E+01	2.3E+02	7.4E+03	7.4E+03
Dieldrin	60-57-1	2.5E-03	Q	2.5E-03	F	2.5E-03	G	2.5E-03	G	2.0E-01				
Diethylphthalate	84-66-2	2.9E+01	N	2.9E+01	X DF 2	1.3E+01	X DF 3	2.3E+01	X DF 3	1.1E+03				
Dimethylphenol,2,4-	105-67-9	7.3E-01	N	7.3E-01	X DF 2	2.8E-01	X DF 3	4.5E-01	X DF 3	7.9E+03				
Dimethylphthalate	131-11-3	3.7E+02	N	3.7E+02	X DF 2	2.2E+02	X DF 3	5.7E+02	X DF 3	4.0E+03				
Di-n-octylphthalate	117-84-0	1.5E+00	N	1.5E+00	X DF 2	6.4E-01	X DF 3	1.2E+00	X DF 3	2.0E-02				
Dinitrobenzene,1,3-	99-65-0	1.0E-02	Q	3.7E-03	X DF 2	3.1E-03	X DF 3	2.8E-02	X DF 3	5.3E+02				
Dinitrophenol,2,4-	51-28-5	7.3E-02	N	7.3E-02	X DF 2	6.1E-02	X DF 3	5.0E-01	X DF 3	2.8E+03				
Dinitrotoluene,2,6-	606-20-2	3.7E-02	N	3.7E-02	X DF 2	2.9E-02	X DF 3	1.7E-01	X DF 3	1.8E+02				
Dinitrotoluene,2,4-	121-14-2	7.3E-02	N	7.3E-02	X DF 2	5.6E-02	X DF 3	2.9E-01	X DF 3	2.7E+02				
Dinoseb	88-85-7	7.0E-03	MCL	7.0E-03	X DF 2	7.0E-03	X DF 3	2.5E-02	X DF 3	5.2E+01				
Endosulfan	115-29-7	2.2E-01	N	2.2E-01	X DF 2	2.2E-01	H	6.4E-04	X DF 3	5.1E-01				

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE 3
MANAGEMENT OPTION 1, 2, AND 3
STANDARDS FOR GROUNDWATER
(mg/l)

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S	Gwesni*	Gwesi*	Gwairni*	Gwairi*
Endrin	72-20-8	2.0E-03	MCL	2.0E-03	X DF 2	2.6E-04	X DF 3	2.6E-04	X DF 3	2.5E-01				
Ethyl benzene	100-41-4	7.0E-01	MCL	7.0E-01	X DF 2	2.4E+00	X DF 3	8.1E+00	X DF 3	1.7E+02	2.3E+03	5.7E+03	3.6E+05	3.6E+05
Fluoranthene	206-44-0	1.5E+00	N	1.5E+00	X DF 2	3.1E-02	X DF 3	3.2E-02	X DF 3	2.1E-01				
Fluorene	86-73-7	2.4E-01	N	2.4E-01	X DF 2	7.4E-02	X DF 3	7.8E-02	X DF 3	2.0E+00	4.5E+03	1.6E+04	2.7E+05	3.8E+05
Heptachlor	76-44-8	4.0E-04	MCL	4.0E-04	X DF 2	4.0E-04	H	4.0E-04	H	1.8E-01				
Heptachlor epoxide	1024-57-3	2.0E-04	MCL	2.0E-04	X DF 2	2.0E-04	X DF 3	2.0E-04	X DF 3	2.0E-01				
Hexachlorobenzene	118-74-1	1.0E-03	MCL	1.0E-03	X DF 2	1.0E-03	H	1.0E-03	H	6.2E+00	2.7E-01	6.7E-01	2.2E+01	2.2E+01
Hexachlorobutadiene	87-68-3	8.5E-04	C	8.5E-04	X DF 2	9.0E-05	X DF 3	1.1E-04	X DF 3	3.2E+00				
Hexachlorocyclohexane,alpha	319-84-6	3.0E-05	Q	1.1E-05	X DF 2	1.8E-06	X DF 3	2.6E-06	X DF 3	2.0E+00				
Hexachlorocyclohexane,beta	319-85-7	6.0E-05	Q	3.7E-05	X DF 2	4.9E-06	X DF 3	6.5E-06	X DF 3	2.4E-01				
Hexachlorocyclohexane,gamma	58-89-9	2.0E-04	MCL	2.0E-04	X DF 2	1.1E-04	X DF 3	2.0E-04	X DF 3	6.8E+00				
Hexachlorocyclopentadiene	77-47-4	5.0E-02	MCL	5.0E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	1.8E+00	6.0E-02	2.1E-01	8.5E+00	1.2E+01
Hexachloroethane	67-72-1	1.0E-02	Q	7.9E-04	X DF 2	1.0E-03	X DF 3	1.7E-03	X DF 3	5.0E+00	2.2E+02	5.5E+02	1.4E+04	1.4E+04
Indeno(1,2,3-cd)pyrene	193-39-5	3.7E-03	Q	9.1E-05	X DF 2	9.1E-05	H	9.1E-05	H	2.2E-05				
Isobutyl alcohol	78-83-1	1.1E+01	N	1.1E+01	X DF 2	9.8E+00	X DF 3	1.6E+02	X DF 3	8.5E+04				
Isophorone	78-59-1	7.0E-02	C	7.0E-02	X DF 2	3.3E-02	X DF 3	3.2E-01	X DF 3	1.2E+04				
Lead (inorganic)	7439-92-1	1.5E-02	MCL	1.5E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA				
Mercury (inorganic)	7487-94-7	2.0E-03	MCL	2.0E-03	X DF 2	2.0E-03	X DF 3	2.0E-03	X DF 3	NA				
Methoxychlor	72-43-5	4.0E-02	MCL	4.0E-02	X DF 2	4.0E-02	X DF 3	4.0E-02	X DF 3	4.5E-02				
Methylene chloride	75-09-2	5.0E-03	MCL	5.0E-03	X DF 2	4.4E-03	X DF 3	8.7E-02	X DF 3	1.3E+04	9.8E+01	2.4E+02	9.0E+03	9.0E+03
Methyl ethyl ketone	78-93-3	1.9E+00	N	1.9E+00	X DF 2	2.0E+01	X DF 3	3.9E+02	X DF 3	2.2E+05	2.4E+05	5.9E+05	1.0E+06	1.0E+06
Methyl isobutyl ketone	108-10-1	2.0E+00	N	2.0E+00	X DF 2	2.6E+00	X DF 3	3.0E+01	X DF 3	1.9E+04	4.0E+04	9.9E+04	1.0E+06	1.0E+06
Methylnaphthalene,2-	91-57-6	6.2E-03	N	6.2E-03	X DF 2	2.6E-02	X DF 3	2.7E-02	X DF 3	2.5E+01	8.4E+01	2.9E+02	5.0E+03	7.0E+03
MTBE (methyl tert-butyl ether)	1634-04-4	2.0E-02	T/O	2.0E-02	X DF 2	2.0E-02	X DF 3	5.5E+02	X DF 3	5.1E+04	4.8E+03	1.7E+04	3.4E+05	4.7E+05
Naphthalene	91-20-3	1.0E-02	Q	6.2E-03	X DF 2	1.7E-01	X DF 3	2.2E-01	X DF 3	3.1E+01	1.0E+01	3.5E+01	6.6E+02	9.3E+02
Nickel	7440-02-0	7.3E-01	N	7.3E-01	X DF 2	6.7E-01	X DF 3	1.3E+01	X DF 3	NA				
Nitrate	14797-55-8	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+03	X DF 3	NA				
Nitrite	14797-65-0	1.0E+00	MCL	1.0E+00	X DF 2	1.0E+00	X DF 3	6.4E+01	X DF 3	NA				
Nitroaniline,2-	88-74-4	5.0E-02	Q	2.1E-04	X DF 2	8.7E-02	X DF 3	5.0E-01	X DF 3	1.3E+03	1.4E+00	4.7E+00	8.3E+01	1.2E+02
Nitroaniline,3-	99-09-2	5.0E-02	Q	1.8E-02	X DF 2	9.4E-02	X DF 3	9.3E-01	X DF 3	1.2E+03	1.7E+03	5.9E+03	1.0E+05	1.4E+05
Nitroaniline,4-	100-01-6	1.1E-01	N	1.1E-01	X DF 2	9.4E-02	X DF 3	9.3E-01	X DF 3	7.3E+02				
Nitrobenzene	98-95-3	3.4E-03	N	3.4E-03	X DF 2	1.5E-02	X DF 3	9.6E-02	X DF 3	2.1E+03	4.3E+03	1.1E+04	2.6E+05	2.6E+05
Nitrophenol,4-	100-02-7	2.9E-01	N	2.9E-01	X DF 2	2.3E-01	X DF 3	1.3E+00	X DF 3	1.2E+04				
Nitrosodi-n-propylamine,n-	621-64-7	1.0E-02	Q	1.0E-02	F	1.0E-02	G	4.4E-05	X DF 3	9.9E+03				
N-nitrosodiphenylamine	86-30-6	1.4E-02	C	1.4E-02	X DF 2	2.2E-03	X DF 3	3.2E-03	X DF 3	3.5E+01				

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LDEQ RECAP TABLE 3
MANAGEMENT OPTION 1, 2, AND 3
STANDARDS FOR GROUNDWATER
(mg/l)

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S	Gwesni*	Gwesi*	Gwairni*	Gwairi*
Pentachlorophenol	87-86-5	1.0E-03	MCL	1.0E-03	X DF 2	1.0E-03	X DF 3	1.0E-03	X DF 3	2.0E+03				
Phenanthrene	85-01-8	1.8E+00	N	1.8E+00	X DF 2	2.0E-01	X DF 3	2.1E-01	X DF 3	1.2E+00	7.3E+04	2.5E+05	1.0E+06	1.0E+06
Phenol	108-95-2	1.8E+00	N	1.8E+00	X DF 2	9.3E+00	X DF 3	8.3E+01	X DF 3	8.3E+04	1.3E+05	1.0E+06	1.0E+06	1.0E+06
Polychlorinated biphenyls	1336-36-3	5.0E-04	MCL	5.0E-04	X DF 2	5.0E-04	H	5.0E-04	H	3.1E-02				
Pyrene	129-00-0	1.8E-01	N	1.8E-01	X DF 2	6.1E-01	X DF 3	1.4E+00	X DF 3	1.4E-01	1.2E+04	4.0E+04	6.8E+05	9.5E+05
Selenium	7782-49-2	5.0E-02	MCL	5.0E-02	X DF 2	5.0E-02	X DF 3	5.0E-02	X DF 3	NA				
Silver	7440-22-4	1.8E-01	N	1.8E-01	X DF 2	1.3E-01	X DF 3	5.4E-01	X DF 3	NA				
Styrene	100-42-5	1.0E-01	MCL	1.0E-01	X DF 2	1.0E-01	X DF 3	7.1E+00	X DF 3	3.1E+02	5.4E+02	1.3E+03	5.4E+04	5.4E+04
Tetrachlorobenzene,1,2,4,5-	95-94-3	1.1E-02	N	1.1E-02	X DF 2	5.4E-04	X DF 3	5.7E-04	X DF 3	6.0E-01				
Tetrachloroethane,1,1,1,2-	630-20-6	5.0E-03	Q	4.3E-04	X DF 2	8.4E-04	X DF 3	2.2E-03	X DF 3	1.1E+03	7.2E-02	1.8E-01	6.9E+00	6.9E+00
Tetrachloroethane,1,1,2,2-	79-34-5	5.0E-04	Q	5.5E-05	X DF 2	1.6E-04	X DF 3	1.8E-03	X DF 3	3.0E+03	6.2E+00	1.5E+01	4.1E+02	4.1E+02
Tetrachloroethylene	127-18-4	5.0E-03	MCL	5.0E-03	X DF 2	6.5E-04	X DF 3	2.5E-03	X DF 3	2.0E+02	1.5E+01	3.6E+01	3.0E+03	3.0E+03
Tetrachlorophenol,2,3,4,6-	58-90-2	1.1E+00	N	1.1E+00	X DF 2	1.5E-01	X DF 3	1.8E-01	X DF 3	1.0E+03				
Thallium	7440-28-0	2.0E-03	MCL	2.0E-03	X DF 2	2.0E-03	X DF 3	2.0E-03	X DF 3	NA				
Toluene	108-88-3	1.0E+00	MCL	1.0E+00	X DF 2	6.1E+00	X DF 3	4.6E+01	X DF 3	5.3E+02	8.9E+01	2.2E+02	1.3E+04	1.3E+04
Toxaphene	8001-35-2	3.0E-03	MCL	3.0E-03	X DF 2	3.0E-03	H	3.0E-03	H	7.4E-01				
Trichlorobenzene,1,2,4-	120-82-1	7.0E-02	MCL	7.0E-02	X DF 2	7.0E-02	X DF 3	1.9E-01	X DF 3	3.0E+02	4.5E+02	1.6E+03	3.1E+04	4.3E+04
Trichloroethane,1,1,1-	71-55-6	2.0E-01	MCL	2.0E-01	X DF 2	2.0E-01	X DF 3	9.1E+00	X DF 3	1.3E+03	1.3E+02	4.6E+02	2.7E+04	3.7E+04
Trichloroethane,1,1,2-	79-00-5	5.0E-03	MCL	5.0E-03	X DF 2	5.6E-04	X DF 3	6.9E-03	X DF 3	4.4E+03	8.4E+00	2.1E+01	6.2E+02	6.2E+02
Trichloroethene	79-01-6	5.0E-03	MCL	5.0E-03	X DF 2	2.8E-03	X DF 3	2.1E-02	X DF 3	1.1E+03	1.0E+01	2.5E+01	1.7E+03	1.7E+03
Trichlorofluoromethane	75-69-4	1.3E+00	N	1.3E+00	X DF 2	6.9E+00	X DF 3	2.0E+01	X DF 3	1.1E+03	3.1E+01	1.1E+02	8.7E+03	1.2E+04
Trichlorophenol,2,4,5-	95-95-4	3.7E+00	N	3.7E+00	X DF 2	5.4E-01	X DF 3	6.4E-01	X DF 3	1.2E+03				
Trichlorophenol,2,4,6-	88-06-2	1.0E-02	Q	6.0E-03	X DF 2	6.5E-04	X DF 3	8.2E-04	X DF 3	8.0E+02				
Vanadium	7440-62-2	2.6E-01	N	2.6E-01	X DF 2	2.3E-01	X DF 3	4.5E+00	X DF 3	NA				
Vinyl chloride	75-01-4	2.0E-03	MCL	2.0E-03	X DF 2	1.9E-03	X DF 3	3.6E-02	X DF 3	2.8E+03	2.0E-01	4.9E-01	6.0E+01	6.0E+01
Xylene(mixed)	1330-20-7	1.0E+01	MCL	1.0E+01	X DF 2	1.0E+01	X DF 3	1.0E+01	X DF 3	1.6E+02	2.6E+01	8.9E+01	3.9E+03	5.4E+03
Zinc	7440-66-6	1.1E+01	N	1.1E+01	X DF 2	5.0E+00	X DF 3	8.0E+00	X DF 3	NA				
Aliphatics C6-C8	NA	3.2E+01	N	3.2E+01	X DF 2	1.7E+02	X DF 3	3.9E+03	X DF 3	NA	9.2E+01	2.3E+02	2.9E+04	2.9E+04
Aliphatics >C8-C10	NA	1.3E+00	N	1.3E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA	3.2E+00	7.9E+00	1.0E+03	1.0E+03
Aliphatics >C10-C12	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA	2.2E+00	5.5E+00	7.0E+02	7.0E+02
Aliphatics >C12-C16	NA	1.4E+00	N	1.4E+00	X DF 2	3.4E+00	X DF 3	7.9E+01	X DF 3	NA	5.3E-01	1.3E+00	1.6E+02	1.6E+02
Aliphatics >C16-C35	NA	7.3E+01	N	7.3E+01	X DF 2	6.7E+01	X DF 3	1.6E+03	X DF 3	NA				
Aromatics >C8-C10	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA	2.9E+01	7.1E+01	5.3E+03	5.3E+03
Aromatics >C10-C12	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA	7.1E+01	1.8E+02	8.1E+03	8.1E+03
Aromatics >C12-C16	NA	3.4E-01	N	3.4E-01	X DF 2	1.3E+00	X DF 3	3.1E+01	X DF 3	NA	1.7E+02	4.1E+02	1.4E+04	1.4E+04

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP TABLE 3
MANAGEMENT OPTION 1, 2, AND 3
STANDARDS FOR GROUNDWATER
(mg/l)

COMPOUND	CAS #	GW 1	NOTE	GW 2	NOTE	GW 3 DW	NOTE	GW 3 NDW	NOTE	S	Gwesni*	Gwesi*	Gwairni*	Gwairi*
Aromatics >C16-C21	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA				
Aromatics >C21-C35	NA	1.1E+00	N	1.1E+00	X DF 2	1.0E+00	X DF 3	2.4E+01	X DF 3	NA				
TPH-GRO	NA	3.4E-01	N,I	3.4E-01	X DF2	1.3E+00	X DF3	3.1E+01	X DF3	NA	3.2E+00	7.9E+00	1.0E+03	1.0E+03
TPH-DRO	NA	3.4E-01	N,I	3.4E-01	X DF2	1.0E+00	X DF3	2.4E+01	X DF3	NA				
TPH-ORO	NA	1.1E+00	N,I	1.1E+00	X DF2	1.0E+00	X DF3	2.4E+01	X DF3	NA				
C - Based on carcinogenic health effects														
F - GW 2 multiplied by maximum DF is less than GW 1 thus default to GW 1														
G - GW 3 multiplied by maximum DF is less than GW 2 thus default to GW 2 and do not multiply by DF 2														
H - GW 3 multiplied by maximum DF is less than GW 2 thus default to GW 2 and multiply by DF 2														
I - TPH Standards are only applicable when used in conjunction with Standards for indicator compounds														
MCL - Based on EPA's Maximum Contaminant Level (MCL) for drinking water														
N - Based on non-carcinogenic health effects														
NA - Not applicable														
Q - Based on analytical quantitation limit														
X DF 2 - Multiply GW 2 by the appropriate site specific dilution factor from the chart														
X DF 3 - Multiply GW 3 DW or GW 3 NDW by the appropriate site specific dilution factor from the chart														
T/O - EPA taste/odor advisory value														
* The MO-1 GWes and MO-1 GWair are presented for screening purposes only; if the CC exceeds the MO-1 GWes and/or MO-1 GWair, then further assessment maybe warraned under MO-2 or MO-3.														

NOTE: See end of Table for designation of letter symbols and footnotes.

LDEQ RECAP
APPENDIX I
STANDARDS FOR GROUNDWATER
DESIGNATION OF LETTERS

C - Based on carcinogenic health effects.
F - GW 2 mulitiplied by maximum DF is less than GW 1 thus default to GW 1 and do not multiply by DF 2.
G - GW 3 mulitiplied by maximum DF is less than GW 2 thus default to GW 2 and do not multiply by DF 2.
H - GW 3 mulitiplied by maximum DF is less than GW 2 thus default to GW 2 and multiply by DF 2.
I - TPH Standards are only applicable when used in conjunction with Standards for indicator compounds.
MCL - Based on EPA's Maximum Contaminant Level (MCL) for drinking water.
N - Based on non-carcinogenic health effects.
Q - Based on analytical quantitation limit.
X DF 2 - Multiply GW 2 by the appropriate site specific dilution factor from the chart.
X DF 3 - Multiply GW 3 DW or GW 3 NDW by the appropriate site specific dilution factor from the chart.
T - EPA taste/odor advisory value.

LDEQ RECAP
APPENDIX I
STANDARDS FOR SOIL
DESIGNATION OF LETTERS

A - Based on algorithm contained in Appendix I.
B - Based on EPA's biokinetic and adult lead cleanup level models for lead.
C - Based on carcinogenic health effects.
F - GW 2 soil water partition equation multiplied by maximum DF is less than SoilGW1 thus default to SoilGW 1.
G - GW 3 soil water partition equation multiplied by maximum DF is less than SoilGW2 thus default to SoilGW 2 and multiply by X DF 2.
H - GW 3 soil water partition equation multiplied by maximum DF is less than SoilGW2 thus default to GW 2 and do not multiply by DF 2.
I - TPH Standards are only applicable when used in conjunction with Standards for indicator compounds.
L - Soil level protective of groundwater for inorganic constituents based on leachability (TCLP listed).
N - Based on non-carcinogenic health effects.
NA - Not applicable.
O - Ceiling value based on aesthetic considerations.
Q - Based on analytical quantitation limit.
S - Soil level protective of groundwater for inorganic constituents based on the maximum concentration for the beneficial use of sewage sludge.
SS - Soil level is based on soil saturation.
T - TPH shall not exceed 10,000.
X DF 2 - Multiply SOILGW2 by the appropriate site specific DF from the chart.
X DF 3 - Multiply SOILGW3DW or SOILGW3NDW by the appropriate site specific DF from the chart.