

DER-XX / Evaluating the Potential for Vapor Intrusion at Past, Current, and Future Sites

New York State Department of Environmental Conservation

DEC Program Policy

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I. SUMMARY:

Proper assessment of potential impacts to indoor air from soil and/or groundwater contaminated with volatile chemicals has become a significant issue in the evaluation of environmental and health impacts at sites across the State based on an evolving understanding of soil vapor migration and intrusion. As a result, all completed, current, and future contaminated sites in New York State will be evaluated to determine whether these sites have the potential for exposures related to soil vapor intrusion. These include all Resource Conservation and Recovery Act (RCRA) Corrective Action sites, inactive hazardous waste disposal sites (State Superfund), Voluntary Cleanup Program sites, Brownfield Cleanup Program sites, Environmental Restoration Program sites, and petroleum spill sites.

The primary focus of this Program Policy is to describe the approach to be used by the Division of Environmental Remediation (DER) for weighing the need to investigate the vapor intrusion pathway at sites where remedial decisions have already been made and prioritizing those sites for subsequent action. The DER is already evaluating the potential for vapor intrusion at all sites currently in the pre-remedial decision phase and will evaluate the vapor pathway at future sites as appropriate. The identification and prioritization procedures described in Section V.2 of this policy will be used to identify past sites with the highest potential for vapor intrusion where remedial decisions were made prior to January 1, 2003.

II. POLICY:

All contaminated sites will be evaluated to determine whether the vapor intrusion pathway is complete. A complete pathway means that humans are being exposed to vapors that originate from site contamination. For sites determined to have a complete pathway, further evaluation is necessary to determine whether the pathway poses a potential significant risk to human health and whether interim or long-term mitigation or remedial measures are necessary. For sites at which it is determined that a vapor intrusion exposure pathway does not exist under current conditions, further consideration of the vapor intrusion pathway must be considered if future plans for the site include development that could result in a complete exposure pathway.

This strategy divides the universe of sites into two groups: 1) sites where remedial decisions have already been made and, 2) sites where remedial decisions have not yet been made. This policy primarily applies to the first group—sites where decisions have already been made—and outlines a process to be used to identify and prioritize those sites for further action. A prioritization approach has been

developed to focus efforts on evaluating these pre-2003 sites with the greatest potential for vapor intrusion first.

Given the fact that vapor intrusion is a rapidly evolving issue with both science and policy implications, a manageable number of past sites will be targeted initially for further study to determine whether impacts associated with vapor intrusion exist. Once the initial investigations are complete and any necessary revisions to the procedures are made, the Department will then begin to investigate the remaining sites identified as having potential vapor intrusion impacts. These initial investigations will provide additional site-specific information to help identify which sites, both old and new, have the greatest potential to have vapor intrusion impacts. It is expected that each year several previously-investigated sites will be selected from each Region at which to conduct further vapor intrusion investigations until all sites requiring further study have been completed.

III. PURPOSE AND BACKGROUND:

Vapor intrusion is the migration of volatile chemicals (in vapor form) from the subsurface into overlying or adjacent buildings. Volatile chemicals can be found in buried wastes, contaminated soils, and/or contaminated groundwater and can emit vapors that may migrate through subsurface soils into buildings. In extreme cases, the vapors may accumulate in buildings to levels that may pose near-term safety hazards (e.g., explosion), acute health effects, or aesthetic problems (e.g., odors). Typically, however, if vapors do migrate into buildings, the levels are considerably lower in comparison and health concerns, if any, relate to chronic effects based on long term exposure to low chemical concentrations.

In the past, vapor intrusion was considered to be a phenomenon caused by soil vapors emanating from a source of volatile chemicals (separate-phase or sorbed) located adjacent to or directly beneath the foundation of an occupied building. Investigation of potential human exposure to these volatile chemicals generally involved soil gas surveys and indoor air sampling. If an off-site dissolved contaminant plume flowing beneath a home or business was deep, the assumption was that the concentrations of any vapors entering buildings above would be so low by the time it reached the basement level that it would not represent an indoor air concern. However, based on more recent studies by the scientific community and our experience, this assumption appears to underestimate the potential for vapor intrusion. The result is that additional work may be required to investigate or remediate sites that are in the operational or monitoring phase or are closed.

Based on a review of the Division's Tracking System as well as information from the Division of Solid and Hazardous Materials (DSHM), it is estimated that solvents or other volatile chemicals have been disposed at over 750 sites, resulting in contaminated soil or groundwater. Many of these sites have already been remediated and are either in the long-term monitoring phase or were closed once remedial objectives established for the cleanup were met. However, based on recent evidence and a better understanding of vapor intrusion and mobility, the vapor intrusion pathway may need to be re-evaluated at these sites since current exposures related to vapor intrusion may exist despite remedial actions already completed.

IV. RESPONSIBILITY:

This strategy was jointly developed by staff from DER and DSHM. Responsibility for interpreting and updating this document will reside with the DER.

V. PROCEDURE:

1. Evaluation of Ongoing Sites

For ongoing sites where final remedial decisions have not been made, the vapor intrusion pathway will be evaluated as a component of the investigation like any other media (e.g., groundwater and soil). A document that provides guidance on protocols for evaluating the soil vapor intrusion pathway (e.g., investigation procedures, data interpretation, and mitigation or remediation alternatives) is currently being developed. This document, entitled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," will include guidance on the appropriate investigation methodology as well as on the evaluation of the investigation data.

2. Evaluation of Pre-2003 Sites

Screening criteria and prioritization score sheets have been developed that will help identify whether the potential may exist for subsurface vapor intrusion at sites where remedial decisions were made prior to 2003. This section describes the criteria established for the initial site screening and the procedure for ranking and prioritizing those sites that meet the screening criteria.

Screening criteria

To help identify legacy sites which may have the potential for a vapor intrusion problem, a flowchart was prepared presenting various screening criteria in the form of questions about the site (Attachment 1). The questions address the presence and nature of volatile chemical contamination at the site. Sites meeting the screening criteria will then be prioritized based on the ranking described below and considered for further evaluation. Sites not meeting the criteria will be given a low priority and evaluated later.

The initial screening is designed to be applied with a general knowledge of a site and the chemicals known or reasonably suspected to be present in the subsurface. To expedite the screening process, the DER Tracking System was used to generate a list of sites where chlorinated volatile organic compounds (CVOCs) were disposed of or detected in soil or groundwater. CVOCs include many of the common organic solvents used at former industrial sites (e.g., trichloroethene) and dry cleaning facilities. DEC is targeting sites with CVOC contamination first (as opposed to non-chlorinated volatile chemicals) because they are found at the vast majority of contaminated sites, they do not readily biodegrade, and they may accumulate indoors without being noticed by the occupant because of their high odor threshold. This effort has resulted in a list of more than 400 sites. Additionally, all RCRA corrective action sites were evaluated in the first step.

While DEC recognizes that non-chlorinated VOCs (such as benzene and toluene) also have some potential for vapor intrusion, they represent less of a concern for several reasons. Non-chlorinated volatile compounds generally have an odor or taste when they are present in drinking water or breathing space and are noticed by impacted individuals. Sites having these characteristics are currently addressed as they are identified. Experience has shown that sites below the odor threshold are generally below levels of concern and do not represent a threat to public health. Non-chlorinated VOCs also readily biodegrade in the presence of oxygen, which is readily available in the vadose zone (zone above the groundwater table) through which contaminants must pass before entering a basement or crawl space. For these reasons, action at the majority of sites with non-chlorinated VOCs will be deferred while the results of further monitoring are evaluated and used to verify these assumptions. Non-chlorinated VOC

sites may be added to the list at a later date based on new information and a revised conceptual understanding of the vapor problem.

Site ranking and prioritization

Sites meeting the screening criteria will be ranked and prioritized using the procedures described below. Two score sheets, one for soil (Attachment 2) and one for groundwater (Attachment 3), have been developed to help prioritize the list of potential vapor intrusion sites based on a ranking system. The score sheets provide a method of assigning scores based on site-specific information such as chemical concentration, depth to contaminated groundwater and soil, soil type, land use above impacted areas at or near the site, presence of NAPL, preferential vapor flow paths, and proximity to sensitive receptors (e.g., daycare facilities, schools, and hospitals).

To facilitate the site ranking and prioritization process, information from Records of Decision (ROD), Statements of Basis (SOB), Facility Fact Sheets, and other summary-level data sources will be collected and entered into a spreadsheet. The sites will be assigned a score based on the available site information and ranked using the score sheet. The sites with the highest score, and presumably the greatest potential for vapor problems, will be placed at the top of the list to address first those sites with the greatest potential to cause indoor air impacts.

Four conditions will be evaluated for soil and groundwater:

1. Total CVOC concentration
2. Depth to contamination
3. Soil characteristics
4. Land use adjacent to the site above impacted soil or groundwater

For each condition, a weighting factor will be assigned depending on the answer. For instance, if the depth to contaminated groundwater is between 15 and 50 ft below grade, then that condition will be given a weight factor of 4, as shown in Attachment 3. Additional points may be added, or subtracted in some cases, based on such site conditions as proximity to sensitive receptors, presence of NAPL, or current information pertaining to the completion of remedial activities. Separate score sheets have been created for vapor intrusion potential from groundwater contamination and for soil contamination.

At the present time, sites with soil contamination and sites with groundwater contamination will be prioritized separately. As we move forward with vapor intrusion investigations at these older sites, we will use the new information to assess whether the assigned weighting factors serve as a useful tool for predicting whether vapor intrusion is likely to be a significant exposure pathway at a site. Adjustments to the weighting factors may be made to improve their usefulness as predictors.

The list of sites generated through the identification and prioritization process outlined above will be combined with other efforts that have identified sites with the potential for vapor intrusion issues. As a final measure, staff will be requested to review the prioritized list and confirm the information used to score and rank the sites.

Vapor intrusion investigation

After the initial list has been reviewed by DER staff as a check on the validity of the screening process and to find out about other potential sites which for one reason or another did not rank highly, a manageable number of pre-2003 sites will be targeted initially for further study to determine whether

indoor air impacts associated with site contaminants actually exist. This determination will require a certain amount of field sampling and characterization to supplement any existing information. The scope of such sampling efforts (numbers of samples, locations, analytical methods) will be determined on a site-specific basis.

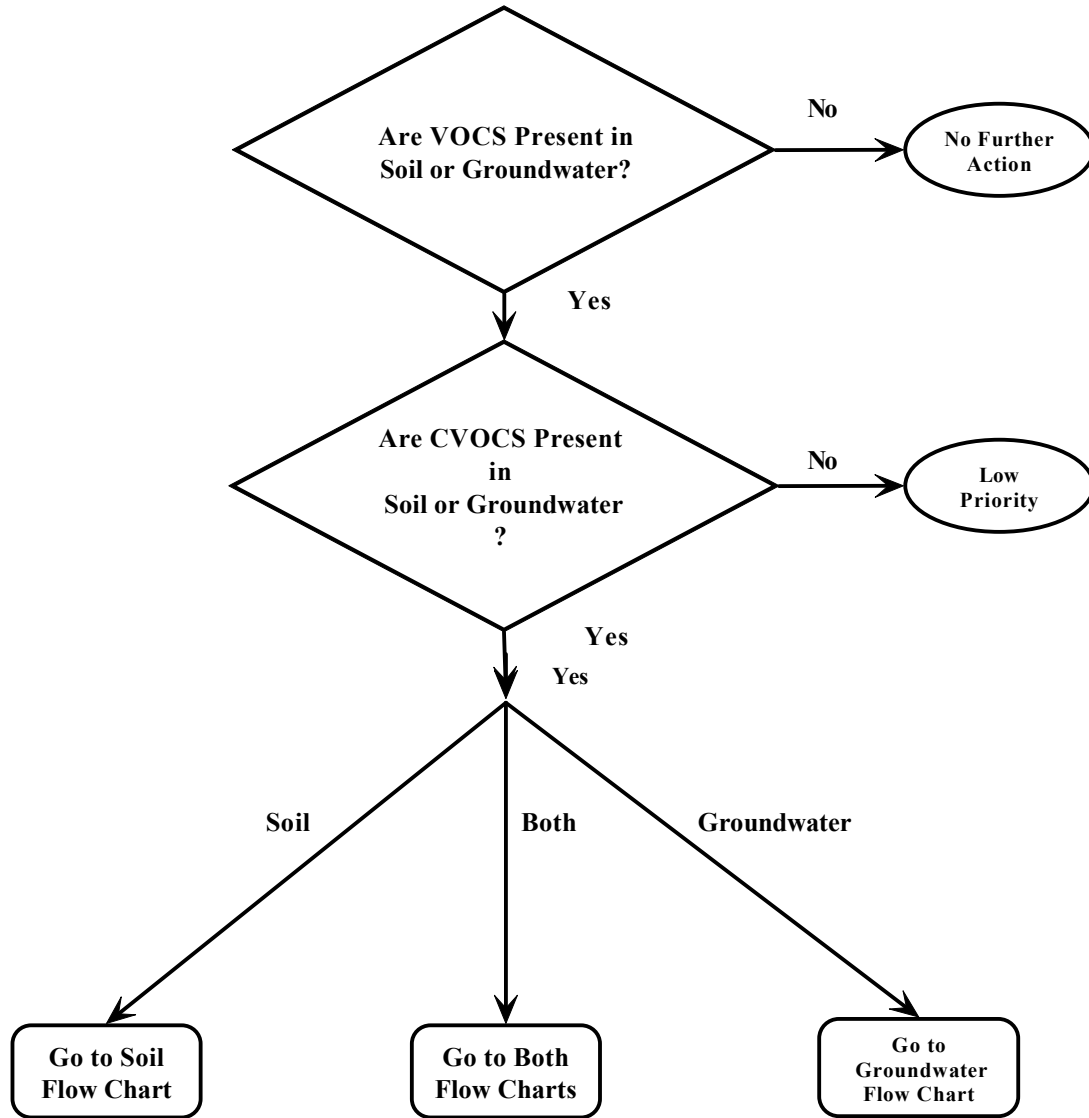
At a minimum, a vapor intrusion investigation at a site identified through the process described in this policy as having a potential for vapor intrusion issues will involve soil gas sampling between any remaining on-site sources of VOCs and the nearest occupied buildings, either on-site or off-site, to estimate the extent of any vapor plumes associated with the site that could impact these structures. If soil gas contamination is not found within 100 feet of an existing occupied structure or one that is planned, then the site will be given a low priority and further investigation of vapor impacts will be deferred. If soil gas sampling indicates that vapors have migrated beneath an occupied building, then sub-slab and indoor air sampling will be necessary to further evaluate potential impacts.

If groundwater within 100 feet of or beneath an occupied building is contaminated with VOCs, then a characterization effort involving sub-slab and indoor air sampling will be initiated. If recent groundwater quality data is not available, a limited groundwater investigation may be required to evaluate current groundwater conditions (i.e., nature and extent) downgradient of any remaining on-site sources of VOCs and make this determination. If groundwater contaminated with VOCs is not found within 100 feet of an occupied building, then the site will be given a low priority and further investigation of vapor impacts will be deferred.

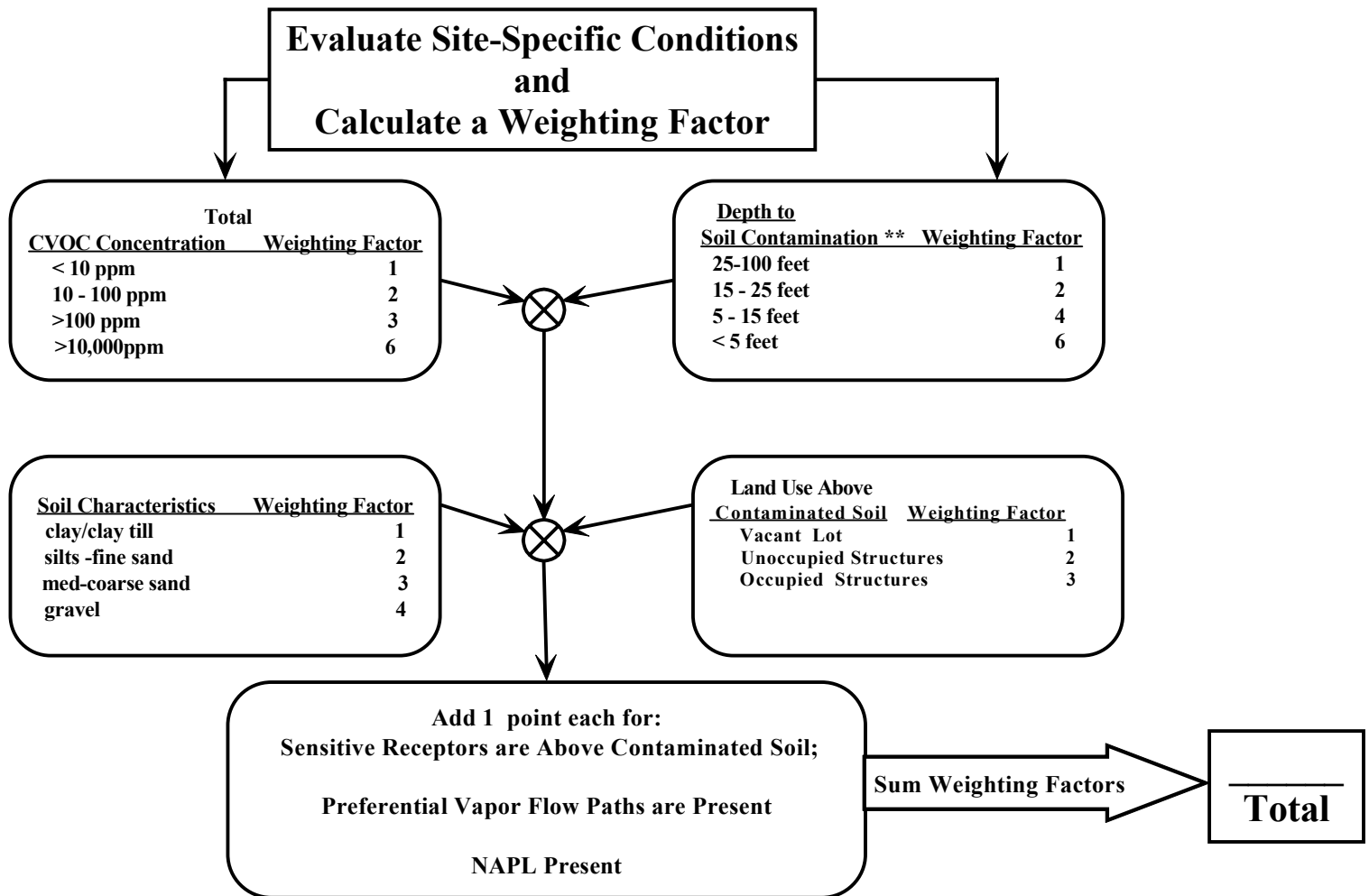
Schedule

Vapor intrusion investigations will commence beginning with the highest ranked sites on the priority list in order to focus efforts on the sites determined to have the greatest potential for exposure and to gain experience in performing vapor intrusion evaluations. This experience will be applied to future investigations as well as be incorporated into DER guidance. Once the first few investigations are complete and any necessary revisions to the procedures outlined in this policy are made, the DER will then begin to investigate the remaining sites identified as having potential vapor intrusion impacts.

It is expected that each year several previously-investigated sites will be selected from each Region at which to conduct further vapor intrusion investigations until all sites requiring further study have been completed. This process will take several years to complete based on current investigative techniques and assumptions regarding the vapor intrusion phenomenon.



Soil Screening for CVOC Vapor Intrusion

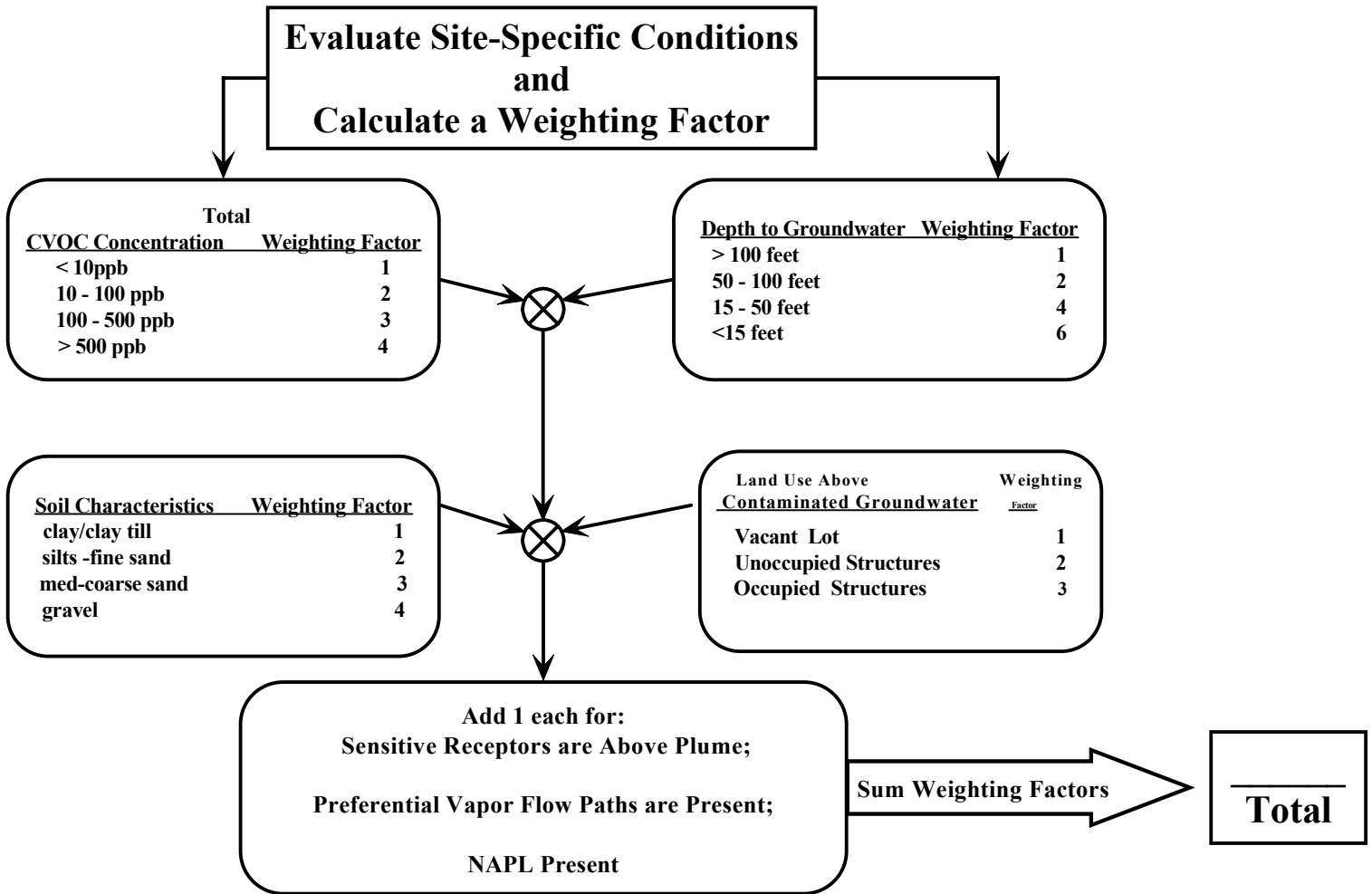


Note: Sensitive Receptors = (day care centers, elder care facilities, hospitale, etc.)

Preferential Flow Paths = (pipes & pipe bedding, joints and fractures, sumps and other penetrations)

** The weighting factor for the depth to soil can be adjusted upward or downward to account for the stratigraphic distribution of the contamination and the building types that sit over it. (For example, shallow soil contamination in areas where there are no buildings should be given a low weighting; soil contamination at foundation depths should be given a higher weighting if buildings that sit over it have basements.)

Groundwater Screening for CVOC Vapor Intrusion



Note: Sensitive Receptors = (day care centers, elder care facilities, hospitale, etc.)

Preferential Flow Paths = (pipes & pipe bedding, joints and fractures, sumps and other penetrations)