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In cooperation with the Texas Natural Resource Conservation Commission

Overview of the Texas Source Water Assessment Project

In November 1999, the State of Texas received U.S. Environmental Protection Agency (EPA) approval of its Source Water Assessment and Protection (SWAP) Program. This approval represents a major milestone in an ongoing cooperative effort between the Texas Natural Resource Conservation Commission (TNRCC) and the U.S. Geological Survey (USGS) to develop and implement a scientifically-defensible methodology for assessing susceptibility of Texas' public water supplies (PWS) to contamination.

Background

The 1996 Amendments to the Safe Drinking Water Act require, for the first time, that each state prepare a source water assessment for all PWS. Previously, Federal regulations focused on sampling and enforcement with emphasis on the quality of delivered water. These Amendments emphasize the importance of protecting the source water.

States are required to determine the drinking-water source, the origin of contaminants monitored or the potential contaminants to be monitored, and the intrinsic susceptibility of the source water. Under the amendments to the Act, States must create SWAP Programs. The programs must include an individual source water assessment for each public water system regulated by the State. These assessments will determine whether an individual drinking water source is susceptible to contamination.

During 1997–99, TNRCC and USGS staff met as subject-matter working groups to develop an approach to conducting Source Water Susceptibility Assessments (SWSA) and a draft workplan. The draft workplan was then presented to and reviewed by various stakeholder and technical advisory groups. Comments and suggestions from these groups were considered, and a final workplan was produced and presented to the EPA. After EPA approval, work formally began on the Texas SWAP Project. The project has an expected completion date of September 2002. At that time, initial SWSA of all Texas public water supplies should be complete.

Ground-water supplies can be considered susceptible if a possible source of contamination (PSOC) exists in the contributing area for the public-supply well field or spring, the contaminant travel time to the well field or spring is short, and the soil zone, vadose zone, and aquifer-matrix materials are unlikely to adequately attenuate the contaminants associated with the PSOC. In addition, particular types of land use/cover within the contributing area may cause the supply to be deemed more susceptible to contamination. Finally, detection of various classes of constituents in water from wells in the vicinity of a public supply well may indicate susceptibility of the public-supply well even though there may be no identifiable PSOC or land use activity.

Surface-water supplies are by nature susceptible to contamination from both point and non-point sources. The degree of susceptibility of a PWS to contamination can vary and is a function of the environmental setting, water and wastewater management practices, and land use/cover within a water supply's contributing watershed area. For example, a PWS intake downstream from extensive urban development may be more susceptible to non-point source contamination than a PWS intake downstream from a forested, relatively undeveloped watershed. Surface-water supplies are also susceptible to contamination from point sources, which may include permitted discharges, as well as accidental spills or other introduction of contaminants.

The development of a scientifically-defensible methodology for assessing the susceptibility of Texas PWS to contamination, based on the most accurate, readily available hydrologic, hydrogeologic, point source, non-point source, and other natural-resource and environmental data, will better enable the TNRCC SWAP staff to:

- Focus its source water protection efforts on PWS that are more susceptible to contamination.
- Potentially reduce monitoring costs associated with ensuring safe drinking water.
- Assist the public in developing an improved understanding of the source of their water.
- Support the implementation of best management practices as needed to protect source waters.

Approach

For the Texas SWAP Project, susceptibility of a PWS is defined as the potential for the PWS to withdraw water containing a listed contaminant(s), at a concentration that would pose concern, through any of the following pathways: (1) direct injection or discharge; (2) soils; (3) geologic strata including faults, fissures, or other types of secondary porosity; (4) overland flow; (5) up-gradient water or streamflow; and (6) cracks in a well casing or intake pipe.

Susceptibility of a PWS to contamination is related to (1) the physical integrity of the well or intake and the pipe transmitting water from the well or intake, the treatment plant, and the distribution system; (2) the anthropomorphic, physical, geologic, hydrologic, chemical, and biological characteristics of the source water area over which, or through which, water and contaminants will move to the supply point; (3) the type and number of PSOCs and land use within the contributing area of a supply well, spring, or intake; and (4) the nature and quantity of contaminants that have been or potentially could be released within a contributing area, as well as measures in place to prevent such releases.

The Texas SWAP Project consists of work in three subject areas: Assessment Software and Database Structures, Ground-Water Assessments, and Surface-Water Assessments. The Ground-Water Assessments and Surface-Water Assessments subject areas are further defined as sets of components, where each component deals with a specific problem domain of the SWSA.

Assessment Software and Database Structures

The objectives of this subject area are to design and develop database structures, assessment software, and technical documentation specifically designed to support staff in performance of SWSA on TNRCC computers.

SWSA are technically complex activities dependent on relational database programming and spatial analysis techniques. Spatial analysis techniques are mostly available in commercial Geographic Information Systems (GIS) software as lower-level computer functions. These functions are available as macros or "system commands," but require specialized expertise to combine them into usable software components capable of performing the higher-level analyses required for SWSA.

Decision rules governing the assessment of PWS susceptibility must be encoded and made available so that they may be applied to data derived from spatial analysis, local SWAP-specific databases, as well as to data retrieved from TNRCC's agency-wide databases. In some cases, these rules are simple yes/no tests; in other cases, a series of logic tests involving several relational database files must be applied. The software system developed will be easy to use by staff charged with assessing PWS and will be compatible with TNRCC's existing databases. Specialized training in GIS technology will not be required. Because of the volume and variety of required data and the level of technical detail of SWSA, the staff requires access to software documentation and help files, metadata, bibliographic, and other supplementary information. The system being developed will make these data files and references available to the analyst at all times.

To complete the large number (more than 17,000) of assessments required, the software must be capable of supporting unattended (batch) processing of SWSA. As larger-scale datasets are produced for Texas, SWSA will be repeated, hence the ongoing requirement for unattended processing. In cases where a single assessment (a new PWS) or a small number of assessments are to be completed, an interactive version is desired. It is anticipated that as SWSA become more technically complex, and larger-scale datasets come on-line, assessments will require interactive rather than batch processing.

Software development efforts include: (1) requirements analysis, design, development, testing, and documentation of database structures and assessment software; (2) a data-object model defining overall database structure, data tables, data fields within tables, data-entity relations, and including a data dictionary; (3) user interface software used for display of GIS coverages, database query, hardcopy output, or report generation; (4) spatial analysis software for delineation of contributing areas, calculation or determination of weighted variables, characteristics, threshold values; (5) software to assist the user in applying appropriate decision rules for determining susceptibility within SWSA components and determining overall susceptibility, and; (6) a graphical user interface to provide user access to databases, assessment software, on-line help, and documentation and support for interactive or batch processing.

Ground-Water Assessments

The Ground-Water Susceptibility Assessments subject area consists of seven components, each addressing a specific problem domain. The primary focus of this subject area is the design and development of databases and software to enable SWSA on PWS with ground water as the primary source of the water.

Identification Component

It is necessary to identify which aquifer a well derives its water from, as all subsequent determinations in SWSA are based on aquifer type and hydrologic characteristics of the aquifer.

In Texas, 9 major and 20 minor aquifers have been mapped. These 29 aquifers have been subdivided and assigned some 450 aquifer codes, each having its own geologic, hydrologic, and water-quality characteristics. These aquifer codes have been developed for several uses, including regulation of public drinking water, however the 29 major and minor aquifers do not provide sufficient detail for the purposes of the SWAP. Alternatively, data requirements for 450 aquifer codes are beyond the scope of this component. Thus, agreement was reached between the various stakeholders, including representatives of TNRCC, Texas Water Development Board (TWDB), and USGS, regarding a designation of about 45 aquifer codes that provide adequate detail.

Texas aquifers, for the purposes of SWAP, are designated as one of five major aquifer categories. Four of the categories are unconfined isotropic aquifers, confined isotropic aquifers, alluvial aquifers along major rivers, and anisotropic karst aquifers. Additionally, there are some public ground-water supplies in Texas that do not obtain water from the mapped major and minor aquifer systems, or that obtain water where an aquifer determination cannot be made. Thus, a fifth aquifer category of "unknown," is required for the susceptibility-assessment purposes. Separate approaches have been developed for the five aquifer categories, because of their hydrogeologic characteristics.

Contributing Area Delineation Component

SWSA require that the contributing area to each PWS well or spring be determined so that PSOCs occurring within may be identified and assessed as to their potential effect on water quality.

Delineation of the contributing area for water to enter the ground-water system for a specific well field or spring is complicated by: (1) complex geologic structure, (2) ground-water/surface-water interaction, (3) heterogeneous aquifer matrix material resulting from the depositional environment of the aquifer, and (4) limited site-specific aquifer information.

Although there are several methods for determination of contributing areas of a PWS well or spring, flow-net analysis was chosen because of the regional scale of the problem, as well as knowledge of, and assumptions made about the hydrogeologic properties of Texas aquifers. Using specially-developed GIS software, the portion of the flow net that defines the contributing area for the water-supply well or spring will be identified, and a determination of time-of-travel to the well for all aquifer categories will be made, with the exception of the Edwards aquifer, where data from the USGS flowpath investigations for the Edwards aquifer will be used.

Using this approach, the characterization of the aquifer is such that the vertical movement of water to the water table is not approximated; only the horizontal movement. The assumption is that the contributing area to a well in an unconfined system is the area directly above the flowpaths for a specified end time (2, 5, 10, 20, and 100 years). In a confined system, the contributing area is that area within specified end times or terminating in the outcrop of the aquifer for similarly specified end times.

Tasks associated with this component are focused on developing datasets and software for delineation of contributing areas to PWS wells or springs that derive their water from the five categories of aquifers. GIS coverages produced under this component include (1) time-of-travel and contributing area for wells or springs in confined or unconfined isotropic aquifers and alluvial aquifers, (2) contributing area for wells or springs in the Edwards aquifer; and (3) contributing area for wells or springs in unknown aquifers.

Non-Point Source Component

This component will involve a statewide investigation to develop statistical relations between known occurrences of non-point source contaminants in ground water and the natural and anthropomorphic factors or activities (referred to as environmental variables) within the capture zone contributing the water. To supplement existing TNRCC and USGS contaminant occurrence databases, 160 PWS wells are being sampled during 1999–2000. The PWS wells selected for sampling are located primarily in shallow, unconfined aquifers (those most susceptible to non-point source contamination) and have characteristics representative of a range of environmental variables that may influence source water susceptibility. Samples are being collected using specialized, low-level detection sampling procedures developed by the USGS and are analyzed for selected soluble pesticides, volatile organic compounds (VOCs) including methyl *tert*-butyl ether (MTBE), and nitrates. Environmental variable databases also are being compiled (to the extent that data are available) to support the development of statistical relations. These statewide databases of potential explanatory variables are wide-ranging and include land use (percent urban, population density, animal densities/concentrated animal feeding operations (CAFOs), agricultural crop acreage, oil and gas production), selected natural factors (soil properties and hydrologic characteristics), and urban and agricultural pesticide and nutrient use. TNRCC will develop threshold values from the statistical relations.

Point Source Component

A primary step in assessing the susceptibility of a ground-water supply to contamination is locating PSOCs that are within the contributing area of a supply. Selected categories of PSOCs that may contribute contaminants to the PWS well or spring are underground storage tanks; operative and closed solid and hazardous waste-management units, including landfills, surface impoundments, and waste piles; uncontrolled hazardous waste disposal and spill sites, including Superfund sites; waste injection wells, including the family of Class V wells; and septic systems.

Texas state databases hold records for an estimated 65,000 known PSOCs. While locational information for the majority of these sites is available from the databases, the information is not accessible using the spatial analysis software within the various SWAP components. Approximately 10,000 PSOCs have no digital locational information (latitude/longitude) as is required. The information for these sites may be available from a physical review of paper files maintained by TNRCC's various PSOC programs. In some cases, PSOCs may have been located on USGS topographic maps whereas in other cases only paper engineering reports, site drawings, or field sketches may exist. In still other cases, only street address information is available in the file.

A large amount of work is ongoing to obtain accurate locational data for PSOCs. Interviews with pertinent TNRCC staff who manage PSOC programs were conducted to determine data type, attributes, locations, quality, availability, and documentation. A comprehensive flowchart and list of interview questions to facilitate this process were developed and followed. For each PSOC that locational data are required, the paper file is physically pulled, reviewed, and pertinent information extracted, to allow the PSOC, if possible, to be located on a USGS topographic map or equivalent. Supplemental maps or commercial databases with address or location information will be required to locate some PSOCs.

This information is then input into a GIS database that will provide a variety of information on PSOCs, including the TNRCC program that collects and manages the PSOC data, the source material for the data, descriptions of data quality, and minimal accuracy standards (or needs) for PSOC locations. The database will be linked to the list of regulated contaminants (and contaminant groups) and to Standard Industrial Codes. A relational database providing technical data on the environmental behavior and fate contaminants will be developed to assist evaluation of a potential contaminant or group of contaminants associated with the PSOC. The output from spatial analyses and database software of this component is a list of PSOCs within the contributing area of the PWS. The software will also provide a list of contaminants and quantities (when available) associated with the PSOC that are analyzed as part of subsequent components.

Contaminant Occurrence Component

Some aquifers have naturally occurring contaminants that render the water less desirable for human consumption. Thus, an analysis, both spatially and temporally, of existing ground-water and PWS entry-point monitoring data is needed to determine if the measured occurrence of a contaminant(s) in water from an aquifer is caused by natural or anthropomorphic conditions. This analysis also may uncover sources of contamination caused by breaches of the confining unit for a confined aquifer. Several existing databases contain ground-water quality data useful for this analysis. Using spatial analysis techniques, water-quality sampling sites will be identified within a 1-mile search radius around each PWS well and spring. If detections of contaminants within this area are found, then the PWS would be assessed as being susceptible to either anthropogenic or naturally occurring contamination. These data will be used to identify sites with contaminant occurrences exceeding designated thresholds for specific constituents within a 1-mile search radius of the PWS well or spring.

Attenuation of Contaminants

Contaminants released from a point source or from the land surface that enter aquifers as solutes in ground water undergo physical, chemical, and biochemical processes that lower their concentrations in the ground water. The concentration of a contaminant in ground water and time-of-arrival at the point of exposure are also determined by the physical, chemical, and biochemical processes that may attenuate (lower) the concentration of the contaminant in ground water. Conservative behavior could mean that a contaminant might exceed the EPA maximum contaminant level (MCL) within a 20-year time-of-travel period of consideration at a PWS. Non-conservative behavior could mean that a contaminant might be attenuated in the soil, vadose zone, or aquifer matrix, depending on its specific properties, perhaps never arriving at the PWS, or arriving at concentrations below levels of concern. Thus, it is important to include considerations of fate and transport based on behavioral data of each contaminant, and physical properties of soil, unsaturated (vadose) zones, and aquifer matrices.

Although the time-of-travel is the most critical element in the evaluation of a PWS susceptibility, an assessment of the attenuation property of the soils, vadose zone, and aquifer matrix in the contributing area of the well or spring will be considered in the assessment. Some of the most important properties of the soil zone affecting contaminant fate and transport are permeability, thickness, and total organic material content. Additionally, the greater the depth to water, the longer the travel time will be to the aquifer through the vadose zone. The rock type of some aquifers may also inhibit the transport of some contaminants. A decision matrix will be developed for these properties to assess the generalized intrinsic capability of these zones to attenuate contaminants. The output of software using the decision matrix developed for this component will be a determination of whether the contaminant in question would be attenuated before affecting the PWS.

Susceptibility Summary Determination Component

This component will determine the cumulative susceptibility of the PWS to each listed contaminant or contaminant group, as contributed by point and non-point sources. The susceptibility determination will be automated using software to populate a matrix-type table with unique codes describing the PWS, surface- and ground-water hydrologic setting, PSOC(s) and their contaminant(s), intrinsic capability to attenuate contaminants, and so on. The matrix will include every possible combination of codes with a pre-defined susceptibility determination. The software will compare the codes generated for each water system against the decision rules and apply a summary determination of susceptibility. This complex and extensive information will be simplified into a form easily comprehended; a detailed report prepared for the water purveyor; and a summary report produced for the public. A similar reporting method has been used for the last several years by the TNRCC Vulnerability Assessment Program and will provide a simple, objective, rapid, and automated evaluation.

Surface-Water Assessments

The Surface-Water Susceptibility Assessments subject area consists of seven components, each addressing different problem domains. The primary focus of this subject area is the design and development of databases and software to enable SWSA on PWS with surface-water as the primary source of water.

Delineation Component

The contributing watershed area must be determined for surface-water intakes or outlets of PWS reservoirs so that PSOCs within the contributing watershed may be identified and evaluated. Land use types within the contributing watershed must be determined to assess their potential non-point source impact on the water supply. Characteristics such as rainfall, runoff, and reservoir storage must be obtained for the contributing watershed to assess the intrinsic susceptibility of each surface-water supply. Six types of watersheds are used in SWSA, as follows:

- Contributing watershed to the intake (delineated at the PWS reservoir outlet or at the mapped location of the intake on the stream).
- Contributing watershed to a stream, reservoir, municipal-stormwater, or other water-quality monitoring site.
- Contributing watershed for all non-PWS reservoirs with normal storage capacity greater than 1,000 acre-feet and located within the contributing area of the PWS intake.
- Truncated watershed (as required) for the area within the contributing watershed to the intake but excluding any contributing watersheds of non-PWS reservoirs with normal storage capacity greater than 1,000 acre-feet.

- Area-of-primary-influence defined as the area within 1,000 feet of a reservoir boundary and, for all streams discharging directly to the reservoir, the area within 1,000 feet of the center of the stream channel of an estimated 2-hour travel-time stream reach immediately upstream from the reservoir. For intakes on streams, the area-of-primary-influence is the area within 1,000 feet of the estimated 2-hour travel-time stream reach upstream from the intake.

- Multi-jurisdictional area defined as a contributing watershed area that is outside the State boundary, such as the Red River and the Rio Grande.

Contributing watershed delineations are required for about 500 surface-water-supply intakes, of which about 176 are unique (multiple intakes in various reservoirs). Contributing areas may also be required for an estimated 90 additional reservoirs located within the contributing areas of PWS reservoirs. Finally, areas-of-primary-influence for all surface PWS must be delineated.

Using specially developed software, watershed delineations are generated and then manually adjusted as necessary. Statewide coverages used in the watershed delineation process and created specifically or modified for use in this project include:

- Digital Elevation Models (a new statewide database, developed at a 60-meter resolution by the USGS for SWAP).

- Flow direction and flow accumulation datasets.

- Hydrography (streams and reservoir boundaries).

Intrinsic Characteristics Component

Surface-water supplies are all susceptible to contamination to some degree because contaminants released at the land surface can potentially reach supplies in relatively short time frames. Factors that can affect the relative magnitude of susceptibility are geology, soil characteristics, vegetative cover, amount of runoff, and attenuation of contaminants in watersheds. Eroded soil may carry, adsorbed on the surface of the sediment particles, organic chemicals, pesticides, nutrients, and heavy metals. The dilution capacity and contaminant degradation capability of a stream or reservoir affect the fate, transport, and degradation of contaminants. Finally, the slope of the land is a major control on the time-of-travel of contaminants in runoff. Assessment of each of these factors would require very detailed, site-specific data that are not readily available in many cases; if the data were available, adding each of these components would result in the susceptibility assessment tool being too complex for source water assessment purposes. Instead, the following four broad measures will be used to assess the intrinsic susceptibility of a PWS:

- Intrinsic susceptibility associated with mean-annual and mean-seasonal surface runoff.

- Intrinsic susceptibility associated with soil erodibility for contributing watersheds of water-supply intakes.

- Potential effects of reservoirs within a watershed on concentration of contaminants.

- Intrinsic susceptibility associated with time-of-travel

Major efforts in support of this component are focused on the development of predictive equations for mean-annual and mean-seasonal runoff based on watershed characteristics; development of GIS databases for mean-annual and mean-seasonal precipitation; and calculation of the ratio of annual and seasonal runoff to annual and seasonal precipitation. Index values will be used to define susceptibility of the PWS caused by runoff.

Development of a soil erodibility database also is required for this component. An index of high, medium, and low soil erodibility soils is being developed that will be used to determine the susceptibility of the PWS to contaminants associated with eroded soils. Higher soil erodibility values indicate higher susceptibility; lower soil erodibility values indicate lower susceptibility.

The potential effect of reservoirs in the watershed will be assessed by analysis of the ratio of total storage in the watershed to annual runoff in the watershed. High index values indicate less susceptibility at the intake because of reservoir storage (a beneficial effect resulting from dilution); low index values indicate increased susceptibility.

To assess a watershed's intrinsic susceptibility associated with time-of-travel, the ratio of the area of the contributing watershed to the basin slope will be calculated. High size-slope ratios indicate longer time-of-travel and thus less susceptibility; low ratios indicate shorter time-of-travel and thus increased susceptibility.

Non-Point Source Component

This component will involve a statewide investigation to develop statistical relations between known occurrences of non-point source contaminants in surface water and the natural and anthropomorphic factors or activities (environmental variables) within the watershed. To supplement existing TNRCC, Clean Rivers Program, and USGS contaminant occurrence databases, 48 PWS reservoirs are being sampled during 1999-2000. The PWS reservoirs selected for sampling have watersheds representative of the various hydrologic conditions and land uses in Texas. Samples are being collected using specialized, low-level detection sampling procedures developed by the USGS and are analyzed for selected soluble pesticides and VOCs (including MTBE). As stated in the ground-water component, environmental variable databases to support the development of statistical relations also are being compiled that include land use (percent urban, population density, animal densities/CAFOs, agricultural crop acreage, oil and gas production), selected natural factors (soil properties and hydrologic characteristics), and urban and agricultural pesticide and nutrient use. TNRCC will develop threshold values from the statistical relations.

Point Source Component

The objective of this component is to assess the susceptibility of surface-water supplies to point source discharges during low-flow conditions. Although point source discharges may be included in the environmental setting variables used statistically, the existing water-quality datasets may not adequately represent low-flow conditions, when point sources have their greatest influence on the water quality of the receiving water body. Therefore, theoretical concentrations of point source-associated contaminants at low streamflow and low-flow reservoir storage conditions will be calculated on the basis of permitted releases of contaminants from point source discharges in the contributing watershed of the surface-water intake or supply reservoir. A ratio of the total permitted releases of the contaminant to reservoir storage, or to mean annual streamflow, will be developed. Higher ratios indicate higher susceptibility.

Contaminant Occurrence Component

Some watersheds have naturally occurring contaminants that render the water less desirable for human consumption. Thus, an analysis, both spatially and temporally, of existing surface-water quality and PWS point-of-entry (POE) monitoring data is needed to determine if the occurrence of a contaminant(s) in water is caused by natural conditions in the watershed. Several existing databases contain surface-water quality data useful for this analysis, such as TNRCC surface-water-quality and entry-point databases and USGS National Water Information System databases. Using spatial analysis techniques, these data will be identified within each watershed containing a PWS intake or reservoir. If naturally occurring contaminants within a watershed are detected, the contributing watershed will be assessed as susceptible to contamination from naturally occurring contaminants.

Contaminant detections also serve as a confirmation check of the methodology for assessing the degree of susceptibility of source water to contamination. Stream, reservoir, and entry-point monitoring data will be used to verify assessment decisions. If a surface-water source is determined to have low susceptibility to a particular contaminant, then monitoring data should not reveal detections. If monitoring data reveal detections, the assessment model needs to be re-evaluated. If a surface-water source is determined to have high susceptibility, data may or may not support the assessment. The lack of detection may only mean that the stream, reservoir, and PWS, or POE monitoring data were not collected at the appropriate “hydrologic” time, such as during or just after a runoff event, or during baseflow conditions.

Area-of-Primary-Influence Component

The proximity of a surface-water intake to a point source discharge, potentially adverse land use, major transportation corridor, or pipeline can result in the source water being susceptible to contamination. The relatively short time-of-travel of a chemical spill, continuous release, or runoff to the intake minimizes the opportunity for reducing a contaminant concentration or converting or degrading a contaminant to a less hazardous form.

The approach will consist of compilation and/or creation of GIS datasets as necessary to support area-of-primary influence (API) assessments using software developed under a separate task. For intakes in reservoirs, an API will initially be defined as the area within 1,000 feet of a reservoir boundary, and for all streams discharging directly to the reservoir, the area within 1,000 feet of the center of the stream channel of the estimated 2-hour travel-time stream reach immediately upstream from the reservoir. For intakes on streams, the API is the area within 1,000 feet of the estimated 2-hour travel-time stream reach upstream from the intake. On an as-needed basis, the API will be tailored to the specific PWS by the incorporation of ancillary datasets such as flood-prone areas and/or actual time-of-travel where flow characteristics are readily available.

Within the API all PSOCs, including permitted point sources and marinas, land uses, transportation corridors, pipelines, or electrical transmission lines, will be identified along with their associated contaminant groups. A qualitative determination of susceptibility (decreased susceptibility to increased susceptibility) will be assigned on the basis of presence of PSOCs, potential for releases or spills of contaminants, and contaminants associated with each specific PSOC in the API. The susceptibility determination will be guided by the number of PSOC sites, the total area dedicated to activities known to generate contaminants, and the contaminants and amounts (if available) potentially generated by the various activities within the API.

Susceptibility Summary Determination Component

As in Ground-Water Susceptibility Assessments, this component will determine the cumulative susceptibility of the PWS to each listed contaminant or contaminant group, as contributed by point and non-point sources. The susceptibility determination will be automated using software to populate a matrix-type table with unique codes describing the intake, hydrologic setting, PSOC(s) and their contaminant(s), intrinsic susceptibility, etc. This complex and extensive information will be simplified into a form easily comprehended. A detailed report, as well as a summary report for the PWS will be produced.

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