California
Drinking Water Source Assessment and Protection (DWSAP) Program

Guidance Documents

Included here are various documents released as guidance for the DWSAP program.

They include:

- Completion of an Assessment
- Delineating Protection Zones for Wells Close Together
- Delineating Protection Zones for Springs
- Delineating Protection Zones for Horizontal Wells

California Drinking Water Source Assessment and Protection Program
Interim Guidance for Staff

Water Type: **All**
DWSAP Section: **Completing the Assessment**
Topic: **Completion of the Assessment**
Date: **May 23, 2003**

The DWSAP document does not provide specific details on how to compile and complete a source water assessment. The following guidance should help staff to ensure that assessments are completed consistently.

After the delineation, inventory and vulnerability ranking have been completed the final parts of the assessment can be prepared.

1. Vulnerability Summary

The vulnerability summary is a narrative description of the PCAs to which the source is most vulnerable. The PCAs to which the source is most vulnerable include activities associated with contaminants detected in the water supply, and PCAs with the highest points from the vulnerability ranking.

For example, if there are five types of PCAs in the vulnerability ranking with 17 points, these five PCAs are the ones to which the source is considered most vulnerable, and these are listed in the vulnerability summary in any order. If however, there is only one activity with 17 points, that one PCA is the only one to which the source is most vulnerable, and is the only one that must be stated in the vulnerability summary, along with any PCAs associated with detected contaminants. Similarly, if the highest points on the vulnerability ranking is 13 (or any number above the cutoff), then the PCAs with the highest points are listed in the vulnerability summary. The only time that the source is not considered vulnerable to anything is if there are no PCAs above the cutoff and no contaminants have been detected.

Water suppliers preparing their own vulnerability summary may wish to include additional PCAs that are lower on the vulnerability ranking. This is acceptable, so long as no PCAs in the ranking are skipped; that is, the vulnerability summary can't include PCAs with 13 points unless all the PCAs with higher points are also listed.

The vulnerability summary is to be brief, written in readily understandable language. The vulnerability summary must be included in the water system's annual consumer confidence report (CCR), along with information on the availability of the assessment. The vulnerability summary must be included in the CCR every year after the assessment is completed.

The standardized language for the vulnerability summary is as follows:

"An assessment was completed of the _____ water source for the _____ water system in month and year. A copy of the complete assessment is available at DHS District Office or Water System Office address. You may request a summary of the assessment be sent to you by contacting DHS District Office or Water System Contact phone number.

"The source is considered to be most vulnerable to the following activities associated with contaminants detected in the water supply: _____, _____, and _____.

"In addition, the source is considered most vulnerable to these activities, for which no associated contaminant has been detected: _____, _____, and _____."

1.1 Vulnerability Summary for Multiple Sources

A combined vulnerability summary that includes multiple sources may be prepared if the following criteria are met:

- All sources are the same type of water (i.e., all ground water or all surface water)
- All sources are in close proximity to each other (i.e., protection zones overlap)
- All sources have the same Physical Barrier Effectiveness (PBE) (low, moderate or high)

The combined vulnerability summary must include all the PCAs to which the sources are most vulnerable (i.e., the PCAs with highest points from the vulnerability ranking for each source) and the PCAs associated with detected contaminants for any of the sources.

For example, consider a vulnerability summary for two sources: Source A has PCAs with 17 points, and Source B has PCAs with 13 points maximum. The combined vulnerability summary would list all the PCAs with 17 points for Source A and all the PCAs with 13 points for Source B. Some of the PCAs for the sources may be the same; the PCA only needs to be listed once in the vulnerability summary.

New: For systems with multiple sources that are similar type of water, in similar settings, with similar PCAs to which the source is most vulnerable, it may be appropriate to combine certain types of PCAs for the vulnerability summary. For example, in an urban area, there may be several types of manufacturing at the top of the Vulnerability Ranking for several sources. It may be appropriate in this case to simply list "manufacturing" in the combined vulnerability summary. A similar example could be made for agricultural activities.

The intent is to provide an honest summary of the PCAs to which the sources are most vulnerable, without diluting or confusing the issue by combining too many dissimilar sources into one summary.

DHS should be contacted for guidance on specific water systems.

2. Assessment Summary

The assessment summary should include a brief description of the water system and the water source, the procedures and information used to complete the assessment, the vulnerability summary, and, if desired, additional discussion of the vulnerability of the source. Some of this information may already be prepared for the water system's CCR.

The summary should be no more than one to two pages. The assessment summary may be similar to the following:

> *"The XYZ water system is located in _____ County and serves the community/city/business name, etc. There are approximately _____ service connections serving a population of _____.*
>
> *"The drinking water source for XYZ water system is name of lake, river or aquifer or wells located in general description of the region. The watershed or recharge area for the source includes approximately _____ acres/square miles. General land use in the area is agricultural, urban, residential, undeveloped, forested, etc.*
>
> *"The assessment of _____ source was conducted by DHS District office, County, Water System, etc. The following sources of information were used in the assessment: water system files, DHS files, County records, previous study, etc.*
>
> *"Procedures used to conduct the assessment include: review of files and reports, meetings with water system staff and/or public, GIS mapping, field reviews, other general procedures, unique or specialized procedures, etc.*
>
> *"Vulnerability Summary (as described in Section 5.1)*
>
> *"Vulnerability Discussion (optional). This section may include more information about the source's vulnerability to contamination, such as:*
>
> - *Elaboration on PCAs in the vulnerability summary*
> - *Description of mitigating information about PCAs*
> - *Actions that the water system is taking or will take to deal with identified threats*
> - *Other PCAs in the vulnerability ranking that are above the cutoff*

- *Description of detected contaminants, likely sources of contamination, and monitoring results*
- *Suggestions or plan for more detailed investigation"*

3. Completion and Submission of the Assessment

After completing all of the assessment forms, map, vulnerability summary and assessment summary, the information is to be compiled into a finished report for submission to the regulating agency (DHS District Office or Local Primacy Agency county).

A copy of the complete report should be kept in the office of the regulating agency for review by the public. The water system has the option of keeping a copy available for public review. A brief abstract should be prepared that can be mailed upon request. This brief abstract should include the assessment summary, the map, and the vulnerability ranking.

DHS is currently developing computer software for producing assessment forms. When this software is available water systems will be asked to submit a disk with the assessment forms to the regulating agency. This will allow DHS to track information for reporting to US EPA.

DHS will review assessments prepared by or on behalf of a water system. If DHS finds a problem in the assessment the water system will be asked (but is not required) to revise the assessment. However, if DHS believes there are inaccuracies in the vulnerability summary, the water system must resolve this with DHS before putting the vulnerability summary in its CCR.

4. Updates of the Assessment

Updating the assessment is not required, but is recommended once every five years. DHS will update assessments in conjunction with water system regulatory work as time permits.

The vulnerability summary must be included in the CCR every year after the assessment is completed. If the assessment is not updated the CCR will continue to reflect an assessment date from several years past.

Delineating Protection Zones for Wells that are Close Together

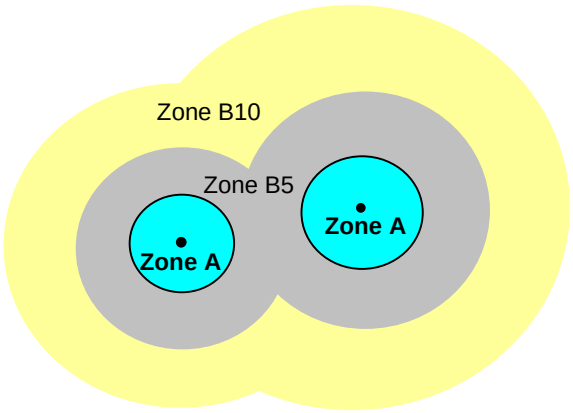
When wells are located in close proximity to each other, their delineated zones will not be discrete areas. Instead their zones will overlap. Sometimes the overlap will be small; other times, the zones may be almost completely on top of one another. If the wells are never operated simultaneously, it is acceptable to delineate zones that are on top of each other.

However, if the wells can operate simultaneously, the actual "zone of contribution" for the wells together extends out further than the delineated zones for the individual wells. For this reason, separate delineations that are on top of each other would underestimate the needed size of the protection zones. In this case a more detailed investigation is necessary. As a simple estimate, a combined delineation can be done, using the following procedures. However, it should be noted that wells operating at the same time cannot pull the same water from the aquifer, so the actual zones of contribution would not overlap. The zones would extend farther upgradient, and would not be circular in shape.

1. Are the wells closer together than the 2-year time-of-travel for either well?

   No – Delineate wells separately, but you may want to combine their zones for the PCA inventory. See Illustration, below.

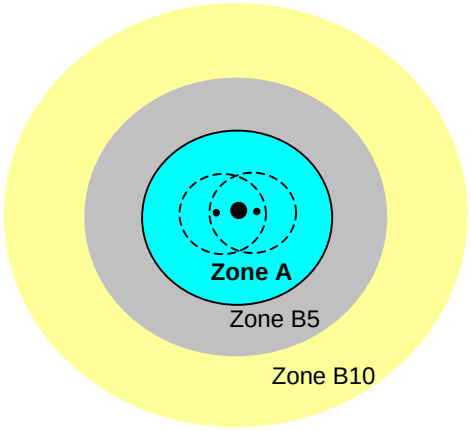
   Yes – Proceed to 2.



2. Consider the wells one source with the combined pumping capacity of both wells, and delineate zones using the Calculated Fixed Radius method.

   - For the pumping rate, add the maximum pumping rates for each well together.
   - For the effective porosity, use the default (0.2), unless you have more specific information.
   - For the screened interval, use the shortest screened interval for the two wells. Do not add the screened intervals together.

When you draw these zones on a map, place the center of the zones at a point halfway between the wells. See illustration below. This procedure can also be used for multiple wells in a wellfield.



Entering the Delineation Into TurboSWAP

Enter the same delineation information into TurboSWAP for each source in the well field. In the delineation task, instead of entering the actual flow rate for a well, or the actual screened interval, you use the combined flow rate and the average screened interval for all the wells. This then ensures that the calculations represent the correct size zones for each source.

In the PBE task, enter the correct flow rate and the correct screened interval (TurboSWAP uses the values from the delineation section as the default). All the wells will have the same delineation calculations, but they will each have their own PBE calculations.

And - you need to describe this in the Comments field of the assessment summary (very important to anyone reviewing the assessment).

Showing the Delineation for Combined Protection Zones in the Mapping Tool

For sources that fall into the first example above, delineate each source as usual, but don't clear the delineations in between. The Mapping Tool will display the overlapping delineated areas. The "Report" feature of the Mapping Tool displays the map and the calculations for each source.

For sources that fall into the second example, with the wells considered as one combined source, use the "User Set Point" feature in the Mapping Tool. Select one point in the middle of the well field, enter in the combined flow rate for all the wells, enter the average screened interval of all the wells, and enter the default or appropriate effective porosity.

The Mapping Tool will display the combined zones, and the "Report" feature will display the calculations, but won't identify the individual sources.

Regardless of which of the methods is used, submit the same map with the assessment for each source. If you have combined the delineation zones for three sources, then you will have one map that you will submit three times.

DELINEATING PROTECTION ZONES FOR SPRINGS

Suggested Approach

The best way to determine the protection zones for a spring is to do detailed hydrogeologic analysis. However, if this is not feasible, the California Department of Health Services (DHS) suggests the following method.

Step 1: Determine if the spring is under the influence of surface water (either direct or indirect). (If this determination has been formalized with DHS, make sure to state this in the assessment summary.) If the spring is under the direct influence of surface water, define watershed boundaries as the outer/overall protection area. To define zones within the protection area, or to define zones for ground water springs, proceed with the following steps.

Step 2: Determine the maximum discharge rate of the spring in gallons per minute (gpm). If the discharge rate is not known, and can be assumed to be less than 20 gpm, proceed to the next step. Otherwise, estimate the discharge rate using previously released guidance.

Step 3: Determine, if possible, the approximate thickness of the aquifer from which the spring receives water. If this information isn't available, move on to the next step.

Step 4: Determine an equivalent 'length of screened interval' for the spring. (It is understood that springs don't have a screened interval, but the intent is to estimate the thickness of the aquifer that is available to contribute flow). Use 10% of the thickness of the aquifer OR 10% of the discharge rate in gpm, whichever is less. Regardless, do not use less than 10 feet.

Step 5: Assume an effective porosity of 0.20 (20%)

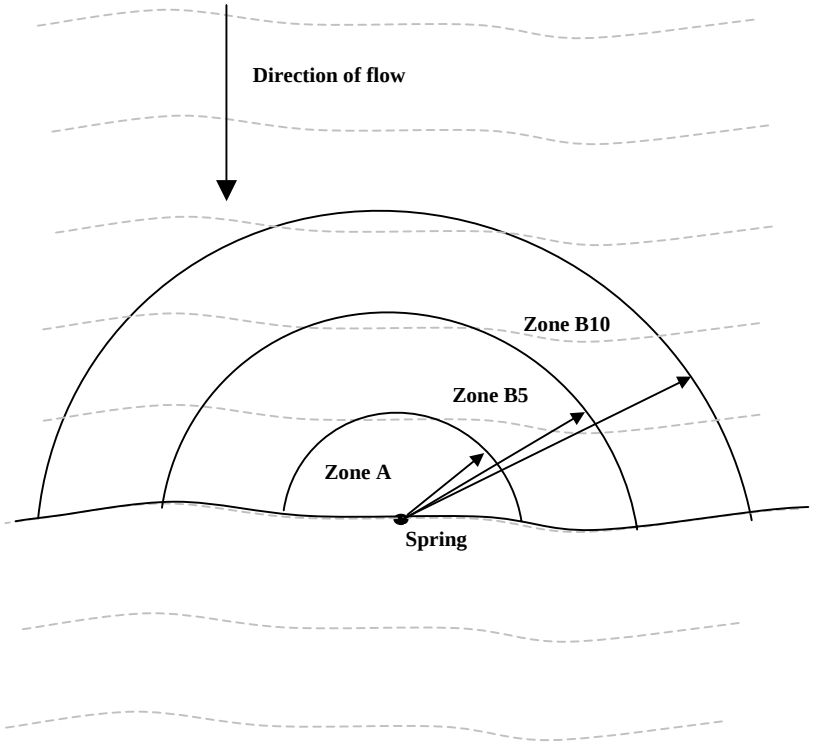
Step 6: Calculate the size of the protection zones for the 2, 5 and 10-year travel times (Zones A, B5 and B10), using the Calculated Fixed Radius method. Use the discharge rate, 'length of screened interval', and effective porosity as described above. If this is a transient system, define only the 2 year time of travel. If the discharge rate is less than 20 gpm, use the minimum distances in the DWSAP program.

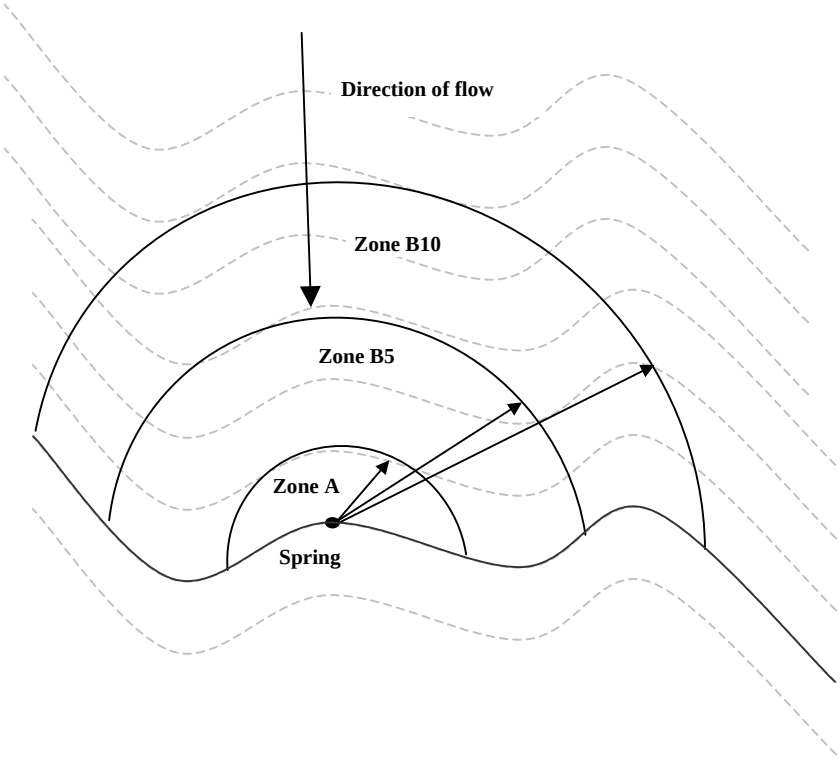
Step 7: If the spring is located in fractured rock increase the size of the zones by 50%.

Step 8: Locate the zones on a USGS quad map. The shape of the zones may be different than for wells, because the springs flow by gravity. Locate the elevation of the spring outlet and draw a topographic contour line at the same elevation. Place the center of the zones at the spring outlet. Draw three zones (one for transient system sources) as semi-circles around the spring outlet. The down gradient limit of the zones is the contour line at the elevation of the outlet (see illustration).

Step 9: Review the delineation and see if it makes sense. Do the protection zones overlap a significant water body? If the water body is up gradient, the spring may be under the influence of surface water.

(See illustrations next page)





Delineation of Protection Zones for Springs

DELINEATING PROTECTION ZONES FOR HORIZONTAL WELLS

Suggested Approach

A horizontal well is any well that is drilled at an angle above the horizontal plane (i.e., water can flow by gravity). The best way to determine the protection zones for a horizontal well is to do detailed hydrogeologic analysis. However, if this is not feasible, the California Department of Health Services (DHS) suggests the following method.

Step 1: Determine if the horizontal well is under the influence of surface water (either direct or indirect). (If this determination has been formalized with DHS, make sure to state this in the assessment summary). If the horizontal well is under the direct influence of surface water, define watershed boundaries as the outer/overall protection area. To define zones within the protection area, or to define zones for ground water horizontal wells, proceed with the following steps.

Step 2: Determine the maximum discharge rate in gallons per minute (gpm). If the discharge rate is not known, and can be assumed to be less than 20 gpm, proceed to the next step. Otherwise, estimate the discharge rate using previously released guidance.

Step 3: Determine, if possible, the approximate thickness of the aquifer from which the horizontal well receives water. If this information isn't available, move on to the next step.

Step 4: Determine an approximate 'length of screened interval' for the source. Use 10% of the thickness of the aquifer OR 10% of the discharge rate in gpm OR the length of perforated piped in the horizontal well, whichever is less. Regardless, do not use less than 10 feet.

Step 5: Assume an effective porosity of 0.20 (20%)

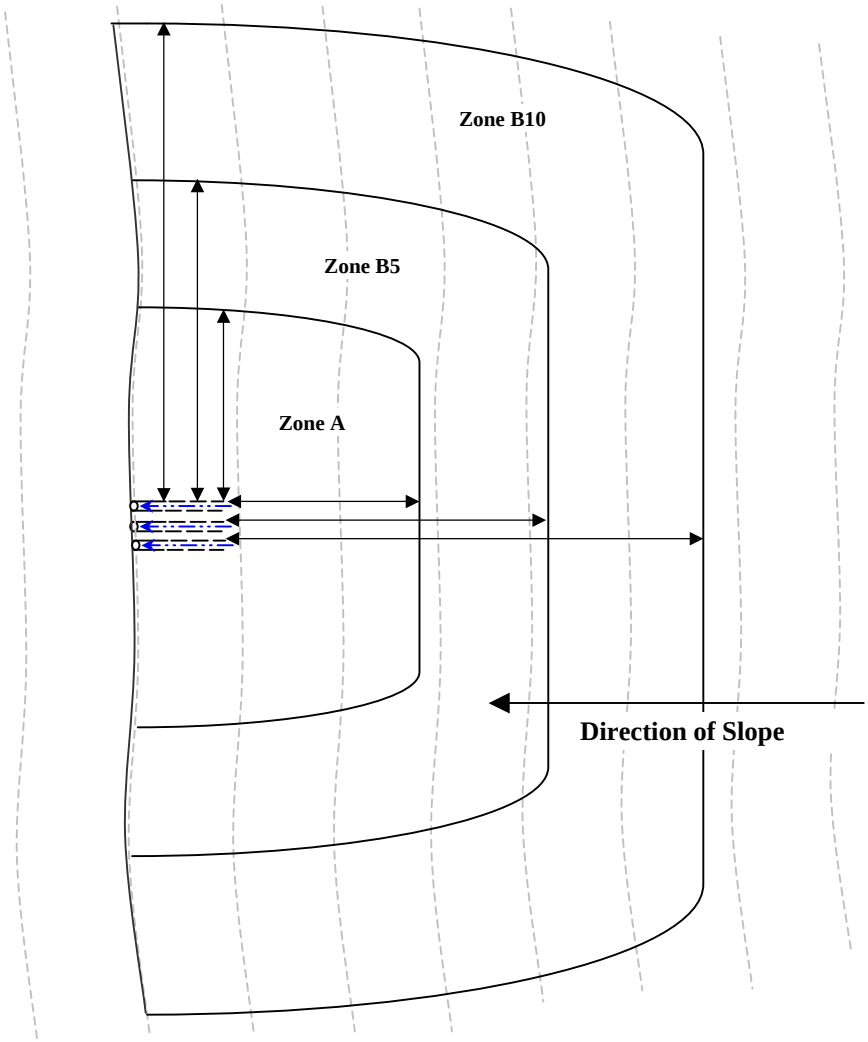
Step 6: Calculate the size of the protection zones for the 2, 5 and 10-year travel times (Zones A, B5, and B10), using the Calculated Fixed Radius method. Use the discharge rate, 'length of screened interval' and effective porosity as described above. If this is a transient system, define only the 2 year time of travel. If the discharge rate is less than 20 gpm, use the minimum distances in the DWSAP program.

Step 7: If the horizontal well is located in fractured rock increase the size of the zones by 50%

Step 8: Locate the zones on a USGS quad map. The shape of the zones will be different than for vertical wells. Locate the elevation of the pipe outlet and draw a topographic contour line at the same elevation. Draw three zones (one for transient system sources) around the pipe outlet. Place the center of the zones at the outlet. The zones should extend up gradient the length of the collection piping plus the zone distance. The zones should extend to each side of the collection piping the zone distance (see illustration). The down gradient limit of the zones is the topographic contour line at the well outlet.

Step 9: Review the delineation and see if it makes sense. Do the protection zones overlap a significant water body? If the water body is up gradient, the horizontal well may be under the influence of surface water.

(*See illustration next page*)



Delineation of Protection Zones for Horizontal Wells