Drinking Water Source Assessment

Water System

System name

_____ County

Water Source

Source name

Assessment Date

Month, year

California Department of Health Services
Drinking Water Field Operations Branch
DHS _____ District

District No.	_____
System No.	_____
Source No.	_____
PS Code	_____

Checklist for Drinking Water Source Assessment - Ground Water Source

District Name _____ District No. _____ County _____
System Name _____ System No._____
Source Name _____ Source No. _____ PS Code: _____

Completed by _____ Date _____

The following information should be contained in the drinking water source assessment submittal.

_____Cover Page

_____Checklist *(this form)*

_____Assessment Summary

_____Vulnerability Summary

_____Source Location Form *(not currently available, contact DHS for information)*

_____Delineation of groundwater protection zones

_____Source Data Sheet (select appropriate form)

- _____Well Data Sheet
- _____Spring Data Sheet
- _____Horizontal Well Data Sheet

_____Physical Barrier Effectiveness Checklist

_____Possible Contaminating Activities (PCA) inventory form

_____Vulnerability Ranking

_____Assessment map with source location and protection zone

_____Additional maps (optional) (e.g. local maps of zones and PCAs, recharge area maps, or maps indicating direction of ground water flow)

_____Means of Public Availability of Report (indicate those that will be used)

- _____Notice in the Consumer Confidence Report* (minimum)
- _____Copy in regulatory agency (DHS or LPA) office (minimum)
- _____Copy in public water system office (recommended)
- _____Copy in public library/libraries
- _____Internet (indicate Internet address: _____)
- _____Other (describe)

*The CCR should indicate where customers can review the assessments.

Assessment Summary

District Name _____ District No. _____ County _____
System Name _____ System No._____
Source Name _____ Source No. _____ PS Code: _____

Completed by _____ Date _____

Description of System and Source

The WATER SYSTEM NAME water system is located in COUNTY NAME County and serves the [COMMUNITY | CITY | BUSINESS NAME]. There are approximately [XXX] service connections serving a population of [XXXXXX].

The drinking water source for the WATER SYSTEM NAME water system is [AQUIFER | WELLS\SPRING\HORIZONTAL WELLS] located in [GENERAL DESCRIPTION OF REGION]. The [RECHARGE AREA] for the source includes approximately [XXXXXX] [acres | square miles]. General land use is [agricultural | urban | residential | undeveloped | forested] etc.

Assessment Procedures

The assessment of the source SOURCE NAME was conducted by [DHS District office, County office, 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: [file review, calculations, field review, meet with water system, run models, meet with other agencies, use GIS, etc.]

Contents of this Assessment

Yes	☐	**No**	☐	**Assesment Summary**
Yes	☐	**No**	☐	**Vulnerability Summary**
Yes	☐	**No**	☐	**Source Location Form**
Yes	☐	**No**	☐	**Delineation of Protection Zones**
Yes	☐	**No**	☐	**Physical Barrier Effectiveness Checklist**
Yes	☐	**No**	☐	**Source Data Sheet**
Yes	☐	**No**	☐	**Inventory of Possible Contaminating Activities**
Yes	☐	**No**	☐	**Vulnerability Ranking**
Yes	☐	**No**	☐	**Assessment Map**

Comments

Add other comments concerning this assessment.

Vulnerability Summary

District Name _____ District No. _____ County _____
System Name _____ System No._____
Source Name _____ Source No. _____ PS Code: _____

Completed by _____ Date _____

THE FOLLOWING INFORMATION MUST BE INCLUDED IN THE SYSTEM CONSUMER CONFIDENCE REPORT

A source water assessment was conducted for the _____*source name*_____ of the _____*system name*_____water system in *month, year*.

The source is considered most vulnerable to the following activities associated with contaminants detected in the water supply:

PCA1
PCA2
PCA3
Etc.

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

PCA1
PCA2
PCA3
Etc.

Discussion of Vulnerability

In this section, provide more information on the source's vulnerability to contamination.

- *If there are no detected contaminants, use this language or similar:*

  "There have been no contaminants detected in the water supply, however the source is still considered vulnerable to activities located near the drinking water source."

  In addition, you may include a description of actions that the water system is taking to protect the water supply.

- *If there are detected contaminants, use this language or similar:*

  "Describe the detected contaminants and the PCAs with which they are associated. If the detected contaminants cannot be associated with a detected contaminant, explain this. In addition, provide additional information such as:
  - Elaboration on PCAs ...
  - Description of mitigating information ...
  - Actions that the water system is taking ..."

Delineation of Ground Water Protection Zones

District Name _____ District No. _____ County _____
System Name _____ System No._____
Source Name _____ Source No. _____ PS Code: _____

Completed by _____ Date _____

Indicate the method used to delineate the zones:

(For more information refer to the Drinking Water Source Assessment and Protection document)

_____Calculated Fixed Radius (Default) (Show calculations below)

_____Modified Calculated Fixed Radius (Show calculations below and attach documentation for direction of ground water flow)

_____More detailed methods
Type used (i.e., analytical methods, hydrogeologic mapping, modeling):

_____Arbitrary Fixed Radius (For use only by or with permission of DHS—use minimum distances shown below)

Calculated Fixed Radius Equation

The equation for the calculated fixed radius (R) is $R_t = \sqrt{Q\,t / \pi\,\eta\,H}$

R_t = R_2, R_5, or R_{10} corresponding to t (Calculate R for each travel time)
Q = maximum pumping capacity of well
(ft^3/year = gpm * 70,267):_____
t = time of travel (years), 2, 5 and 10 years
π = 3.1416
η = effective porosity (decimal percent) (If unknown, assume 0.2):
_____
H = screened interval of well (feet) (If unknown, assume 10% of Q gpm, 10 ft minimum):
_____

Specific methods follow on next page

Calculated Fixed Radius Delineation Method (Default)

Using the equation presented above, calculate the size of zones for the appropriate aquifer setting of the source.

Porous Media Aquifer

Zone A (2 year TOT) R_2 = _____ft, minimum = 600 ft —use larger: _____ft
Zone B5 (5 year TOT) R_5 = _____ft, minimum = 1,000 ft—use larger: _____ft
Zone B10 (10 year TOT) R_{10} = _____ft, minimum = 1,500 ft—use larger: _____ft

Fractured Rock Aquifer

(Increase size of zones by 50%)

Zone A (2 year TOT) $1.5R_2$ = _____ft, minimum = 900 ft—use larger: _____ft
Zone B5 (5 year TOT) $1.5R_5$ = _____ft, minimum = 1,500 ft—use larger: _____ft
Zone B10 (10 year TOT) $1.5R_{10}$ = _____ft, minimum = 2,250 ft—use larger: _____ft

Modified Calculated Fixed Radius Delineation Method

In porous media aquifers, if the direction of ground water flow is known (see Section 6.2.3), the default zone circle may be shifted upgradient by $0.5R_t$. The upgradient and downgradient limits of the zone are determined below.

Zone A (2-year TOT)

upgradient distance = $1.5R_2$ = _____ft, minimum = 900 ft, use larger: _____ft
downgradient distance = $0.5R_2$ = _____ft, minimum = 300 ft, use larger: _____ft

Zone B5 (5-year TOT)

upgradient distance = $1.5R_5$ = _____ft, minimum = 1,500 ft, use larger: _____ft
downgradient distance = $0.5R_5$ = _____ft, minimum = 500 ft, use larger: _____ft

Zone B10 (10-year TOT)

upgradient distance = $1.5R_{10}$ = _____ft, minimum = 2,250 ft, use larger: _____ft
downgradient distance = $0.5R_{10}$ = _____ft, minimum = 750 ft, use larger: _____ft

Physical Barrier Effectiveness Checklist - Ground Water Source

District Name _____ District No. _____ County _____
System Name _____ System No. _____
Source Name _____ Source No. _____ PS Code: _____

Completed by _____ Date _____

Use the DHS Well Data Sheet (separate document) to complete the following form.

Directions:

1. Read through the form and collect the information needed to complete the form. (Hydrogeology, Soils, Presence of abandoned or improperly destroyed wells, Well construction and operation.)

2. Determine Parameter A, Type of Aquifer.
   - If the aquifer is confined, use the right-hand column, and evaluate only the parameters indicated for confined aquifers.
   - If the aquifer is unconfined, semi-confined, or the degree of confinement is unknown, or if the aquifer is fractured rock, use the left-hand column and evaluate only the parameters for unconfined aquifers.

3. For each parameter appropriate for the source, place a check in the box for the answer that most closely applies to that source. If more than one answer is possible, select the more conservative (i.e. lower points) answer. *[For example, if the depth to static water (Parameter D) has varied between 45 and 55 feet, choose answer 2 (20 to 50 feet).]*

4. Add the points in the column appropriate for the source and interpret the score as shown on the bottom of the last page.
   - Determine whether the source has a High, Moderate or Low Physical Barrier Effectiveness. Use this in the Vulnerability analysis. The higher the points, generally the more effective the source and site are to retarding the movement of contaminants to the water supply.

NOTE: If the source is located in fractured rock the source is considered to have a Low Physical Barrier Effectiveness, regardless of the point total. So, if Parameter B, Aquifer Material is 3, the remainder of the form does not need to be completed.

Physical Barrier Effectiveness (PBE) – Ground Water, page 1 of 2
Source Name:_____Source No.:_____

PARAMETER	*POINTS*			
	Unconfined		Confined	
A. TYPE OF AQUIFER Confinement *(up to **50** points maximum)* choose one				
a. Unconfined, Semi-confined, Fractured Rock, Unknown	0			
b. Confined			50	
B. AQUIFER MATERIAL (Unconfined Aquifer) Type of materials within the aquifer *(up to **20** points maximum)* choose one				
1. Porous Media (Interbedded sands, silts, clays, gravels) with continuous clay layer minimum 25' thick above water table within Zone A	20			
2. Porous Media (Interbedded sands, silts, clays, and gravels)	10			
3. Fractured rock * (* Low Physical Barrier Effectiveness - no further questions required)	0			
C. PATHWAYS OF CONTAMINATION (All Aquifers) Presence of Abandoned or Improperly Destroyed Wells *(up to **10** points maximum)*				
1. Are they present within Zone A (2-year time of travel (TOT) distance)?				
a. Yes or unknown	0		0	
b. No	5		5	
2. Are they present within Zone B5 (2- to 5-year TOT distance)?				
a. Yes or unknown	0		0	
b. No	3		3	
3. Are they present within Zone B10 (5- to 10-year TOT distance)?				
a. Yes or unknown	0		0	
b. No	2		2	
D. STATIC WATER CONDITIONS (Unconfined Aquifer) Depth to static Water (DTW) = _____ feet *(up to **10** points maximum)* choose one				
1. 0 to 20 feet	0			
2. 20 to 50 feet	2			
3. 50 to 100 feet	6			
4. > 100 feet	10			
E. WELL OPERATION (Unconfined Aquifer) Depth to Uppermost Perforations (DUP) DUP = _____ feet Maximum Pumping Rate of Well (Q) Q = _____ gallons/minute Length of screened interval (H) H = _____ feet [(DUP – DTW) / (Q/H)] = *(up to **10** points maximum*) choose one				
1. < 5	0			
2. 5 to 10	5			
3. > 10	10			

Physical Barrier Effectiveness – Ground Water, page 2 of 2
Source Name:_____Source No._____

PARAMETER	*POINTS*			
	Unconfined		Confined	
F. HYDRAULIC HEAD (Confined Aquifer) What is the relationship in hydraulic head between the confined aquifer and the overlying unconfined aquifer? (i.e. does the well flow under artesian conditions?) *(up to **20** points maximum)* choose one				
1. head in confined aquifer is higher than head in unconfined aquifer under all conditions			20	
2. head in confined aquifer is higher than head in unconfined aquifer under static conditions			10	
3. head in confined aquifer is lower than or same as head in unconfined aquifer			0	
4. unknown			0	
G. WELL CONSTRUCTION (All Aquifers) 1. Sanitary Seal (Annular Seal) Depth = _____ feet *(up to **10** points maximum)* choose one				
a. None or less than 20 feet deep	0		0	
b. 20 to 50 ft deep	6		10	
c. 50 ft or greater	10		10	
2. Surface seal (concrete cap) *(up to **4** points maximum)* choose one				
a. Not present or improperly constructed	0		0	
b. Watertight, slopes away from well, at least 2' laterally in all directions	4		4	
3. Flooding potential at well site *(up to **1** point maximum)* choose one				
a. Subject to localized flooding (i.e. in low area or unsealed pit or vault) or Within 100 year flood plain	0		0	
b. Not subject to flooding	1		1	
4. Security at well site *(up to **5** points maximum)* choose one				
a. Not secure	0		0	
b. Secure (i.e. housing, fencing, etc.)	5		5	
Maximum Points Possible	70		100	
POINT TOTAL FOR THIS SOURCE				

Physical Barrier Effectiveness SCORE INTERPRETATION

Point Total		**Effectiveness**	
_____**0 to 35**	**=**	**Low**	(includes all sources in Fractured Rock)
_____**36 to 69**	**=**	**Moderate**	
_____**70 to 100**	**=**	**High**	

Possible Contaminating Activities (PCA) Inventory Form - Ground Water

District Name _____ District No. _____ County _____
System Name _____ System No. _____
Source Name _____ Source No. _____ PS Code: _____

Completed by _____ Date _____

Check the PCA tables that will be used for this drinking water source (assessment must include the "Other" checklist and at least one of the remaining three checklists):

Commercial/Industrial _____

Residential/Municipal _____

Agricultural/Rural _____

Other (required for all) _____

Proceed to appropriate checklist or checklists. Indicate whether the PCA is located in the zone by placing a Y (yes), N (no), or U (unknown) in the appropriate boxes.
Example:

Zone A	Zone B5	Zone B10
Y	N	N
N	**Y**	**U**
U	N	N

Risk Ranking of PCAs, where VH = Very High Risk, H = High Risk, M = Moderate Risk, L = Low Risk

PCA Checklist COMMERCIAL/INDUSTRIAL

PCA (Risk Ranking)	PCA in Zone A?	PCA in Zone B5?	PCA in Zone B10?	Comments
Automobile- Body shops (H)				
Automobile- Car washes (M)				
Automobile- Gas stations (VH)				
Automobile- Repair shops (H)				
Boat services/repair/ refinishing (H)				
Chemical/petroleum pipelines (H)				
Chemical/petroleum processing/storage (VH)				
Dry cleaners (VH)				
Electrical/electronic manufacturing (H)				
Fleet/truck/bus terminals (H)				
Furniture repair/ manufacturing (H)				
Home manufacturing (H)				
Junk/scrap/salvage yards (H)				
Machine shops (H)				
Metal plating/ finishing/fabricating (VH)				
Photo processing/printing (H)				
Plastics/synthetics producers (VH)				
Research laboratories (H)				
Wood preserving/treating (H)				
Wood/pulp/paper processing and mills (H)				
Lumber processing and manufacturing (H)				
Sewer collection systems (H, if in Zone A, otherwise L)				
Parking lots/malls (>50 spaces) (M)				
Cement/concrete plants (M)				
Food processing (M)				
Funeral services/graveyards (M)				
Hardware/lumber/parts stores (M)				
Appliance/Electronic Repair (L)				
Office buildings/complexes (L)				
Rental Yards (L)				
RV/mini storage (L)				

PCA Checklist RESIDENTIAL/MUNICIPAL

PCA (Risk Ranking)	PCA in Zone A?	PCA in Zone B5?	PCA in Zone B10?	Comments
Airports - Maintenance/ fueling areas (VH)				
Landfills/dumps (VH)				
Railroad yards/ maintenance/ fueling areas (H)				
Septic systems - high density (>1/acre) (VH if in Zone A, otherwise M)				
Sewer collection systems (H, if in Zone A, otherwise L)				
Utility stations - maintenance areas (H)				
Wastewater treatment plants (VH in Zone A, otherwise H)				
Drinking water treatment plants (M)				
Golf courses (M)				
Housing - high density (>1 house/0.5 acres) (M)				
Motor pools (M)				
Parks (M)				
Waste transfer/recycling stations (M)				
Apartments and condominiums (L)				
Campgrounds/ Recreational areas (L)				
Fire stations (L)				
RV Parks (L)				
Schools (L)				
Hotels, Motels (L)				

PCA Checklist AGRICULTURAL/RURAL

PCA (Risk Ranking)	PCA in Zone A?	PCA in Zone B5?	PCA in Zone B10?	Comments
Grazing (> 5 large animals or equivalent per acre) (H in Zone A, otherwise M)				
Concentrated Animal Feeding Operations (CAFOs) as defined in federal regulation1 (VH in Zone A, otherwise H)				
Animal Feeding Operations as defined in federal regulation2 (VH in Zone A, otherwise H)				
Other Animal operations (H in Zone A, otherwise M)				
Farm chemical distributor/ application service (H)				
Farm machinery repair (H)				
Septic systems - low density (<1/acre) (H in Zone A, otherwise L)				
Lagoons / liquid wastes (H)				
Machine shops (H)				
Pesticide/fertilizer/ petroleum storage & transfer areas (H)				
Agricultural Drainage (H in Zone A, otherwise M)				
Wells - Agricultural/ Irrigation (H)				
Managed Forests (M)				
Crops, irrigated (Berries, hops, mint, orchards, sod, greenhouses, vineyards, nurseries, vegetable) (M)				
Fertilizer, Pesticide/ Herbicide Application (M)				
Sewage sludge/biosolids application (M)				
Crops, nonirrigated (e.g., Christmas trees, grains, grass seeds, hay, pasture) (L) (includes drip-irrigated crops)				

PCA Checklist OTHER ACTIVITIES

PCA (Risk Ranking)	PCA in Zone A?	PCA in Zone B5?	PCA in Zone B10?	Comments
NPDES/WDR permitted discharges (H)				
Underground Injection of Commercial/Industrial Discharges (VH)				
Historic gas stations (VH)				
Historic waste dumps/ landfills (VH)				
Illegal activities/ unauthorized dumping (H)				
Injection wells/ dry wells/ sumps (VH)				
Known Contaminant Plumes (VH)				
Military installations (VH)				
Mining operations - Historic (VH)				
Mining operations - Active (VH)				
Mining - Sand/Gravel (H)				
Wells - Oil, Gas, Geothermal (H)				
Salt Water Intrusion (H)				
Recreational area - surface water source (H)				
Underground storage tanks - Confirmed leaking tanks (VH)				
Underground storage tanks - Decommissioned - inactive tanks (L)				
Underground storage tanks - Non-regulated tanks (tanks smaller than regulatory limit) (H)				
Underground storage tanks - Not yet upgraded or registered tanks (H)				
Underground storage tanks - Upgraded and/or registered - active tanks (L)				
Above ground storage tanks (M)				
Wells - Water supply (M)				
Construction/demolition staging areas (M)				
Contractor or government agency equipment storage yards (M)				
Dredging (M)				
Transportation corridors - Freeways/state highways (M)				
Transportation corridors - Railroads (M)				
Transportation corridors - Historic railroad right-of-ways (M)				
Transportation corridors - Road Right-of-ways (herbicide use areas) (M)				
Transportation corridors - Roads/ Streets (L)				
Hospitals (M)				
Storm Drain Discharge Points (M)				
Storm Water Detention Facilities (M)				

PCA Checklist OTHER ACTIVITIES (continued)

PCA (Risk Ranking)	PCA in Zone A?	PCA in Zone B5?	PCA in Zone B10?	Comments
Artificial Recharge Projects - Injection wells (potable water) (L)				
Artificial Recharge Projects - Injection wells (non-potable water) (M)				
Artificial Recharge Projects - Spreading Basins (potable water) (L)				
Artificial Recharge Projects - Spreading Basins (non-potable water) (M)				
Medical/dental offices/clinics (L)				
Veterinary offices/clinics (L)				
Surface water - streams/ lakes/rivers (L)				
Wells - monitoring, test holes (L)				

Vulnerability Ranking – Ground Water

Download the "Vulnerability Ranking List" from the DHS website. Follow these directions for using the spreadsheet.

General Notes:

The list in the spreadsheet (GW V*ulnerability Ranking List.xls*, sheet "*GW*") comes from the PCA checklists. Each PCA is listed four (4) times: Zone A, Zone B5, Zone B10, and Unknown.

PCA risk points (Column C) have been assigned based on the risk of the PCA (VH, H, M, or L) for that zone.

To use the Vulnerability Ranking Spreadsheet follow these steps:

1. Conduct the PCA inventory.

2. Make a copy of the spreadsheet "*GW*" and give the new sheet a descriptive name.

3. On the new sheet, delete rows for any PCAs that do not exist in any of the zones. (Remember that each PCA is listed 4 times).

4. Delete rows for PCAs that don't occur in a particular zone (i.e. if the PCA exists only in Zone A, delete the rows for Zone B5, B10 and Unknown).

5. For PCAs whose existence is unknown, delete the appropriate rows (i.e. if you have no idea whether the PCA exists, keep the Unknown row and delete the other three. Similarly, if you know the PCA exists in Zone A but you aren't sure about B5 and B10, delete the rows for B5 and B10 and keep the rows for Zone A and Unknown.)

6. The remaining rows should represent all of the PCAs that exist or whose existence is unknown within the zones. (For some sources, especially in urban areas, this may still be a very long list.)

7. Calculate Physical Barrier Effectiveness for the source. Insert the corresponding points (i.e., H =1, M = 3, L = 5) into column E for all the rows.

8. Determine the Vulnerability Score in Column F (sum of columns C + D + E)

9. Sort the list by the Vulnerability Score, from highest to lowest.

10. The source is considered vulnerable to all PCAs with vulnerability score ≥ 8. Shade these yellow.

11. Review the list. This is a good time to review the assessment with the water supplier. Items to consider:
    a. Are there detected contaminants in the source water? What are the PCAs associated with the contaminants? Are those PCAs at the top of the list? If not, move them there with a note or asterisk.

b. What were the perceived biggest problems before doing the assessment? Are these PCAs at the top of the list? Should they be?
c. Are there PCAs at the top of the list that don't seem particularly important?

12. If there are any concerns with the vulnerability ranking, go back and review the PCA inventory. Revise the inventory as necessary.

13. Revise the vulnerability ranking as necessary.

14. Print the final list, save to disk, and submit with the remainder of the assessment.

Instructions for Groundwater Assessment Map

The assessment map for a groundwater source should be submitted on USGS topographic maps ("quad maps") at 1:24,000 scale. The map should show:

- Location of the source
- Protection Zones
- Significant Possible Contaminating Activities (PCAs) within the zone (optional, but recommended)

The protection zone for groundwater sources are a set of three circles surrounding the source. (For springs and horizontal wells, if determined to be groundwater sources, the protection zones need not include those portions of the circles down gradient of the source.) The radius of the protection zone is determined in the Delineation section of the assessment and depends upon the aquifer material, well pumping rate, screened interval, and aquifer porosity.

USGS quad maps may be obtained from map or backpacking retailers. There are also several computer software programs that include USGS quad maps.

At the discretion of the regulatory agency, the water system may request that the regulatory agency prepare a map displaying the source and zones.

Example maps for a well source and a spring source are attached.