CH2M HILL
9 South Washington
Suite 400
Spokane, WA
99204-0219
Tel 509.747.2000
Fax 509.623.1622

CH2MHILL

July 7, 1997

136236.PM.ZZ

Mr. David Jennings, Wellhead Protection Program Manager
Washington State Department of Health
Division of Drinking Water
P. O. Box 47822
Olympia, WA 98504-7822

Dear Mr. Jennings:

Subject: Approval of Delineation Criteria for Special Wellhead Areas - Spokane Aquifer Joint Board

This letter formally requests the use and approval of Special Wellhead Protection Areas (SWHPA's) for the Spokane Joint Aquifer Board (SAJB) wellhead protection project. Approval is being requested because special criteria were used to delineate the Wellhead Protection Areas for this project.

To provide you with background information, the SAJB is comprised of eighteen water purveyors that serve drinking water to residents and employees of the Spokane area, outside of the City of Spokane. All water supply for these purveyors is provided by the Spokane Aquifer groundwater source.

Current members of the SAJB are:

Carnhope Irrigation District #7
East Spokane Water District # 1
Irvin Water District #6
Liberty Lake Sewer/Water District
Moab Irrigation District #20
Modern Electric Water Company
Orchard Avenue Irrigation District #8
Spokane County Water District #3
Vera Irrigation District #3
Consolidated Irrigation District #19
Hutchinson Irrigation District #16
Kaiser Aluminum - Trentwood
City of Millwood
Model Irrigation District #18
North Spokane Irrigation District #8
Pasadena Park Irrigation District #17
Trentwood Irrigation District #3
Whitworth Water District #2.

The Board commenced their wellhead protection project in 1996. These purveyors coordinated their efforts to present their customers with a consistent, and cooperative plan

with regard to water resource protection. Just before the project commenced, you, the members of the SAJB, and I meet. The purpose of our meeting was to evaluate the delineation criteria for determining the wellhead protection areas. At our meeting it was agreed that the high transmissivity of the aquifer did not lend itself to the standard 1, 5, and 10 year travel times. Therefore the use of an alternative time of travel criteria would be appropriate for this project.

The Board has completed the capture zone analysis for their seventy plus wellfields encompassing over 190 wells. The results of special travel time capture zone analysis is shown on the enclosed capture zone map. Also enclosed is the memorandum provided to all of the purveyors explaining how to establish the time of travel for each well. In general, the special time of travel is linked to the importance of each well site within the purveyors operations. The time of travel, for the alternative analysis ranges from 0.5 to 5 years in length. The average time of travel for all of the project wellfields is 2.5 years. The flowrate used for the analysis is the allotted legal water rights for each well field.

In addition, the Board has performed an analysis to determine the time of travel wherein the majority of the aquifer is captured. The analysis showed that a combined capture zone analysis of all the purveyors occurs within a 5 year time of travel, thereby precluding the need to develop a 10 time of travel.

With this new information, we hereby request the Department of Health to continue authorizing the Spokane Aquifer Joint Board to proceed with the use of alternative time of travel. With this authorization, the Board will not conduct individual 1, 5, & 10 year time of travel delineations. As previously agreed, the Board will complete the project with two protection zones, a special time of travel, and an aquifer wide delineation.

Because the project will soon be preparing management plans beginning in late August 1997, we desire to have you respond to our request within the next two weeks.

If you have any questions, please call me (509) 623-1664, extension 218.

Sincerely,

CH2M HILL

Brad Phelps, P. E.
Project Manager

cc: Ty Wick / President - SAJB
Enclosures

Importance Factors For Water Supply Wells

(SAJB Wellhead Protection Area Delineation)

PREPARED FOR: Spokane Aquifer Joint Board Wellhead Protection Program Members

PREPARED BY: John Porcello/CH2M HILL
Brad Phelps/CH2M HILL

DATE: August 5, 1996

This technical memorandum presents our recommendations on a methodology for defining the importance factors for each of your water supply wells. As you will recall from the most recent board meeting (held on July 25th), the importance factors are needed so that we can delineate special wellhead protection areas for each well. The goal of delineating special wellhead protection areas is to provide an "optimally sized" management area. An "optimally sized" management area has the two following features:

- It is large enough to give the water purveyor time to replace the water source if replacement is needed.
- It is not so large that it becomes unfeasible to implement management or contingency plans.

For each of the wells that will be delineated under this wellhead protection program an importance factor will need to be provided by the utility. We have included a spreadsheet of the wells for your use in providing us with the importance factor information. Should you have any questions, please give Brad Phelps at CH2M Hill a call (ph 747-2000).

Meaning of Importance Factors

The importance factors are related to your time and your system's time capability to respond to a contamination event. You can think of the response time as the period of time that you would need to replace a well if a contamination event were to make it unusable. Options for replacing water production can vary according to such factors as:

- The importance of the well for uninterruptable water supply
- The capability of your distribution system to move water from other available water supply wells to replace the contaminated well's production.
- The ability to obtain water from another purveyor.

At the recommendation of CH2M HILL, the Board agreed during the July 25th meeting to use a time-of-travel (TOT) of 1 year (12 months) as the base time period for delineating a special wellhead protection area (SWHPA). The importance factor for an individual well is related to the one-year TOT and to the response time as follows:

Importance Factor = Response Time / 12 months

An importance factor of less than 1.0 indicates that the response time is less than one year. A value greater than 1.0 indicates the response time is longer than one year. When the computer simulation model is used to perform the delineation for a given well, we will actually tell the model to delineate for a time duration equal to the response time. For example, if the importance factor for a well is 0.5, then the model will delineate a 6-month (1/2 year) wellhead protection area. However, for the purposes of presenting the delineation, the delineated management area will be called a Special Wellhead Protection Area (SWHPA) having a one-year time-of-travel and an importance factor of 0.5.

Methodology for Selecting Importance Factor Values

CH2M HILL believes that it is important to use a specific set of methods for selecting the response times and importance factors at each well. The use of a common set of methods by all SAJB members is important in order delineated management zone to be defensible and understandable by the public.

Table 1 summarizes the methodology for selecting the values and provides a range of values that are recommended for the special wellhead protection areas. The table consists of 15 scenarios that are distinguished by the following considerations:

- **The use of the well.** The following three types of uses are considered.
  - **Primary supply.** Describes wells that are used each month of the year and are considered the purveyors "lead" water supply sources.
  - **Secondary supply.** These water supply sources operate at least 6 months of the year. They supplement the primary wells and serve a broader demand period than seasonal peaking supply sources.
  - **Peaking supply.** These wells operate during less than 6 months of the year. Their primary purpose is to meet peak daily demands during the hottest months of the year.
- **The availability of water from other purveyors.** Agreements and facilities (Interties) may be in place for obtaining water from other, nearby, water purveyors. These interties could replace a portion or all of the lost production of a contaminated source.
- **The design of the distribution system.** Consideration is given to the degree to which the distribution system is capable of handling an increase in pumping at other wells and the capability of the pipelines to distribute water to areas of lost production .

Table 1 lists the response times and the importance factors for each of 15 scenarios. As indicated in the table, the time element does not necessarily need to describe the response time (which measures the ability to replace a well). Instead, it could be the duration of time that the water purveyor wishes to have available to conduct planning work in response to a contamination event. For primary wells, which are used year-round, the planning time may be much longer than the actual time that the purveyor is capable of bringing an alternate source on-line under emergency circumstances. For peaking wells, which are used only on a seasonal basis, the response and planning time may be similar.

The rationale behind the derivation of the response times and importance factors contains the following elements:

1. The highest importance factors are for the primary wells. Progressively lower factors are used for secondary and peaking wells.
2. Primary wells should have importance factors no lower than 1.0. This means that the special wellhead protection area represents the area contributing water to the well during a 1-year time period.
3. Secondary and peaking wells are allowed to have importance factors less than 1.
4. The minimum importance factor for any scenario is 0.1. This corresponds to a 30-day (one-month) time-period for delineation.
5. Importance factors are increased if other adjoining purveyor wells can not supply the necessary water. The importance factors are further increased if agreements and facilities are not currently in place to replace the volume of water that is needed.
6. Importance factors are increased if the distribution system is limited in its ability to convey increased flow from alternate sources (whether those water sources are purveyor-owned or are provided by another purveyor).
7. The maximum importance factor is 5.0, which corresponds to a 5-year time-period for delineation. Delineations for longer time periods may result in areas that are large and may be difficult to manage.

Assumptions incorporated into the methodology are:

1. The flow rate provided by the lost well needs to be replaced in full to maintain current service capacity without rationing, conservation, or other measures which would impact the utilities customers. This assumption is incorporated into all 15 scenarios listed in Table 1. If this assumption is unrealistic for a given well or purveyor, then the importance factors can be adjusted downwards (but not below 0.1).
2. If the necessary volume of water can presently be obtained from other purveyors (through interties), then the distribution system is assumed to be capable of delivering this flow. This assumption is incorporated into scenarios 5, 10, and 15.

3. If there is no existing alternate water source (either a purveyor-owned well or an intertie), then the distribution system is assumed to require additional capital expenditures. This assumption is incorporated into scenarios 4, 9, and 14.

TABLE 1
Methodology and Rationale for Response Times and Importance Factors
SAJB Wellhead Protection Program

Scenario	Well Use [a]	Is the lost flow rate available from other wells? [b]	Can the lost production be obtained from an interti? [c]	Distribution System Capabilities [d]	Response Time or Planning Time (months)	Importance Factor [e]
1	Primary	Yes	---	Capable	≤ 12	1.0
2	Primary	Yes	---	Limited	12 - 36	1.0 - 3.0
3	Primary	Yes	---	Incapable	24 - 60	2.0 - 5.0
4	Primary	No	No	Limited or Incapable	24 - 60	2.0 - 5.0
5	Primary	No	Yes	Capable	12 - 24	1.0 - 2.0
6	Secondary	Yes	---	Capable	9 - 12	0.75 - 1.0
7	Secondary	Yes	---	Limited	12 - 36	1.0 - 3.0
8	Secondary	Yes	---	Incapable	24 - 60	2.0 - 5.0
9	Secondary	No	No	Limited or Incapable	18 - 60	1.5 - 5.0
10	Secondary	No	Yes	Capable	6 - 12	0.5 - 1.0
11	Peaking	Yes	---	Capable	3 - 6	0.25 - 0.5
12	Peaking	Yes	---	Limited	6 - 36	0.5 - 3.0
13	Peaking	Yes	---	Incapable	12 - 36	1.0 - 3.0
14	Peaking	No	No	Limited or Incapable	6 - 36	0.5 - 3.0
15	Peaking	No	Yes	Capable	1 - 12	0.1 - 1.0

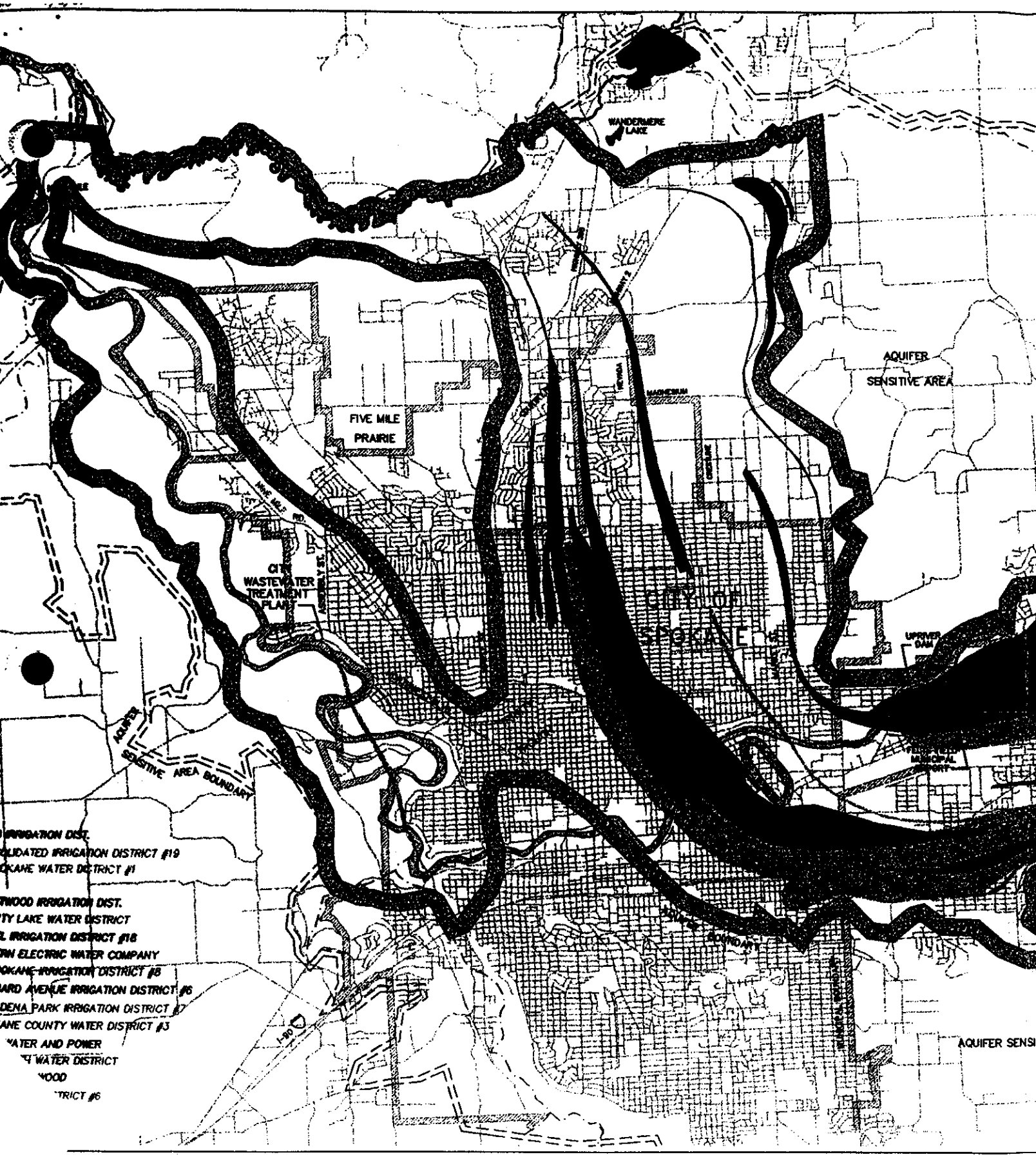
(a) Well uses are defined as follows:
Primary: Used on a year-round (or nearly year-round) basis
Secondary: Helps with summer peak demands, but also used at other times.
Peaking: Used exclusively for peak demand periods.

(b) It is assumed that the lost pumping needs to be replaced.

(c) Dashes indicate that this question is not relevant (i.e., capacity is available at other wells).
"Yes" entry assumes that agreements and facilities are in place and that supply is available.

(d) Distribution system capabilities are defined as follows:
Capable: Pumping loss at this well can be replaced by pumping from another well without exceeding capacity of distribution system at other wells.
Limited: Pumping increases may not be possible at other wells without exceeding capacity of distribution system. May depend on season during which pumping needs to be increased at other wells.
Incapable: System would require capital improvements before increasing pumping at other wells.

(e) Equals response time divided by one year.


WANDERMERE LAKE
AQUIFER
SENSITIVE AREA
FIVE MILE
PRAIRIE
MAGNESIUM
CITY
WASTEWATER
TREATMENT
PLANT
CITY OF
SPOKANE
AQUIFER
SENSITIVE AREA BOUNDARY
IRRIGATION DIST.
OLIDATED IRRIGATION DISTRICT #19
OKANE WATER DISTRICT #1
RWOOD IRRIGATION DIST.
TY LAKE WATER DISTRICT
L IRRIGATION DISTRICT #18
WN ELECTRIC WATER COMPANY
OKANE IRRIGATION DISTRICT #8
ARD AVENUE IRRIGATION DISTRICT #6
DENA PARK IRRIGATION DISTRICT #7
ANE COUNTY WATER DISTRICT #3
WATER AND POWER
WATER DISTRICT
WOOD
TRICT #6
AQUIFER SENSI

SPOKANE AQUIFER JOINT BOARD
AND
CITY OF SPOKANE
SPOKANE AQUIFER WELLHEAD CAPTURE ZONES