

CHAPTER 5

PRESENTATION OF RESULTS

DOCUMENTATION OF THE EFFORT

Complete documentation of a WHP area delineation effort is extremely important. Good documentation will enable Ohio EPA to accurately evaluate the adequacy of the delineation. It also allows for peer review and enables other communities to adopt any techniques that are appropriate for their own wellfields. The following provides an outline of important components that should be incorporated into a report when presenting a WHP area delineation effort to the Ohio EPA.

Introduction

The introduction should describe the community's water needs (population served, current usage, and planned usage). Also, discussion should be provided of the considerations that motivated the community to develop a wellhead protection plan, and how the delineation effort is related to the overall plan. A map of the wellfield and its surroundings should be included, along with a narrative description of the wellfield. Any known plumes of ground water contamination should be described and indicated on the map.

Hydrogeologic Setting

A narrative, with appropriate cross-sections and maps of the local and regional hydrogeologic system should be provided. Such a discussion typically includes regional and local topography, soil type, surface water features, regional and local geology (including stratigraphic identification and description of units), regional and local recharge and discharge areas and ground water resources.

Conceptual Hydrogeologic Model

A discussion of the local ground water flow system should be provided. The direction of local flow and the known or estimated zone of influence of the wellfield should be described and indicated on a site map. The text should be supported by a site-specific potentiometric map.

Rationale for Delineation Method Choice

The reasons for the selection of a particular delineation method should be explained in terms of hydrogeologic, planning, and resource considerations, as discussed in Chapter 2.

Data Collection

Methods and techniques for collecting, analyzing, and interpreting data should be explained. Levels of confidence for parameters should be discussed, as well as any data gaps and any simplifying assumptions used. If aquifer tests (pumping tests, slug tests, etc.) were conducted, the supplier may summarize the results in the text of the report, but should include in an appendix the time-drawdown data, the type curves produced from the data, and the equations used to analyze the data. All terms used in an equation should be defined. Units should be indicated consistently throughout the analysis.

Presentation of Input Data

All data used to delineate the zone of contribution, directly or indirectly, should be presented. Presentation methods include tables, cross-sections, and various maps, such as: hydrogeologic maps showing flow boundaries, topographic maps showing surface water features, potentiometric

surface maps, bedrock configuration maps, saturated thickness maps, hydraulic conductivity maps, and storage coefficient maps.

All maps should be clear and readable, with scale markings. To provide sufficient detail, the scale of maps should be no smaller than 1:24,000. On potentiometric maps, the location of wells providing water level measurements should be indicated clearly. Well logs for those wells should be included in an appendix to the Report, keyed to their locations on the map. The date of each water level reading used to construct the map should be included (preferably in a single table, provided either in the text or the appendix). The aquifer unit(s) and any confining unit(s) should be described in as much detail as possible.

Presentation of Computer Modeling Information

If computer models are used for the delineation of a WHP area, then "screen dumps" of the input data should be included in the documentation so that any reviewer with a copy of the model can reproduce the modeling effort exactly, to check for accuracy. (Again, such information could be included in an appendix to the report.) Also, within the text of the report additional items may need to be discussed, as applicable to the type of model used.

Model Calibration - Where the model requires matching measured and model-derived values at nodes (i.e., calibration), the specific goals and procedures of calibration should be presented and discussed. Results of the final calibrated model should be presented and analyzed, and departure from the calibration targets should be analyzed. The departure may be presented graphically as histograms or as superposed maps, wherein the potentiometric map achieved by the model is superposed over a potentiometric map based on actual water level measurements. The advantage of the map presentation is that the location(s) of greatest discrepancy can be identified. The effects of this departure on the model results should be discussed in the text. If available, the overall water and/or chemical balance of the model should be evaluated and presented.

Sensitivity Analysis - All model sensitivity analyses should be presented and interpreted. Input parameters that have the greatest impact on modeling results should be identified, and their effect(s) on the model should be described.

Additional History Matching - Goals and procedures of any additional history matching should be presented and discussed. **Documentation of historical data or an applied stress for model comparison** should be presented. Additional sensitivity analyses on these new comparisons should be made and documented.

Data Pre- and Post-Processing - All pre- and post-processing of model input and output data should be described and any computer codes utilized should be documented. The modeler(s) should describe the data manipulation process and why it was conducted.

Model Prediction - All predictive simulations should be described in detail, and the output from these scenarios should be presented and interpreted. The modelers should present and discuss model water balance, highlighting such features as pumpage, recharge, leakage, etc. All predictions should be presented in the context of the fundamental assumptions of the model. Limitations of and confidence in model predictions should also be stated.

Delineation Results/Summary

The results of the delineation effort should be presented, including the limitations of the method and all assumptions. The degree of uncertainty--and any measures taken to address the uncertainty--should be discussed. The delineated one-year and five-year time-of-travel areas should be drawn on an unfolded original USGS 7.5 minute quadrangle map for the area, to enable Ohio EPA to enter the information into its Geographical Information System database.

OHIO EPA REVIEW PROCEDURE

Upon completion of the WHP Area Delineation Report, the supplier should send the report to the Division of Drinking and Ground Waters at the Ohio EPA's Central Office in Columbus, Ohio. The report will be reviewed for major conceptual or technical errors, and will be evaluated as "acceptable" or "unacceptable". The supplier should be aware, however, that the delineation of a WHP Area is only one component of the entire Wellhead Protection Plan, and Ohio EPA acceptance of one component does not constitute endorsement of the entire Plan. When the WHP Plan is submitted in its entirety, the supplier should have addressed adequately all Ohio EPA comments on the original delineation report. Only then can the Ohio EPA endorse a community's Wellhead Protection Plan as adequately addressing all components of Ohio's WHP Program.