DRAFT REPORT

Evaluation of Available Remedial Technologies and Conceptual Design of Recommended Remedial Approach for the Person Generating Station, Public Service Company of New Mexico

Prepared For

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ES ENGINEERING-SCIENCE

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EXECUTIVE SUMMARY

The objective of this report is two-fold. First, this report documents the screening of technologies and development of a remedial approach appropriate for use at the Person Generating Station site to remove volatile organic compound (VOC) contamination in both soil and shallow groundwater. Second, the report also presents results from predictions of the shallow groundwater VOC plume migration and associated risks at the site using several different response action scenarios and a fate and transport model based on available site data.

Earlier investigations indicate little potential for dense nonaqueous phase liquid (DNAPL) contamination at the site. Site monitoring activities have revealed concentrations of several volatile organic contaminants, including 1,1-dichloroethene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA), and tetrachloroethene (PCE), in both soil and shallow groundwater. The source of this contamination was a below-grade waste oil tank, which was removed from service in October 1983. The tank was used to store a variety of liquid waste streams, including steam cleaning residues containing chlorinated solvents.

A range of remedial technologies appropriate for use at sites with soil and groundwater VOC contamination are briefly described and then evaluated against OSWER Directive 9902.3 criteria. Selected technologies were then combined into a two-phased remedial approach recommended for the Person Generating Station site. The recommended remedial approach makes use of several technologies considered appropriate for the site, namely, groundwater pumping, above-ground treatment of groundwater using air stripping technology, and soil vapor extraction for the removal of VOCs from source area soils. A two-phased approach is recommended which includes an initial phase of pilot testing followed by a final design and full-scale remediation phase.

The recommended remedial action should also account for natural fate and transport processes occurring at the site. A three-dimensional fate and transport model, MODFLOW/MT3D, was used to predict possible shallow groundwater VOC plume behavior in the event that no action was taken at the site. The model was then used to simulate the impact of both nine years of pumping and removal using five extraction wells and 11 years of natural attenuation and six years of pumping and removal using four extraction wells and 14 years of natural attenuation. All simulated data is presented at time equal to 20 years from initiation of treatment. Fate and transport data derived from the no action model run indicate that the areal extent of the contaminant plume should change very little over the next twenty years. Additionally, it appears that minimal downgradient or vertical migration is to be expected under pumping or

non-pumping alternatives. A significant decrease in the concentration of VOCs in the shallow groundwater is predicted following implementation of pump-and-treat technologies. The model demonstrates that VOC concentrations could be reduced below 5 ppb after only six years of pumping using four extraction wells and 14 years of natural attenuation.

Data from these modeling efforts were then coupled with site characteristics to estimate the potential risk of human exposure to contaminants from the Person Generating Station site. Under all pump-and-treat options considered at this site, there are no completed pathways of exposure from any of the contaminated media present at the site. The lack of significant downward or vertical migration of any remaining VOCs in the shallow groundwater has effectively isolated the contamination from potential human and ecological receptors. Therefore, no current risks to human health or the environment are anticipated to exist from the shallow groundwater contamination. Implementation of soil gas vapor extraction techniques at the site during remediation activities may require offgas treatment to minimize potential exposure of site workers to contamination. Future risks posed by remaining contaminants should be assessed after evaluating the results of soil vapor extraction and groundwater pump-and-treat activities.

SECTION 1

INTRODUCTION

This report provides supporting data necessary to prepare a remedial action plan for the Person Generating Station site shallow groundwater remediation project as directed in Phase II, Item 1.B, of the Corrective Action Directive (CAD).

1.1 PURPOSE AND ORGANIZATION OF REPORT

Engineering-Science, Inc. (ES) was contracted by the Public Service Company of New Mexico (PNM) to perform several critical tasks involved in selecting, designing, and implementing an appropriate response action at the Person Generating Station site which is located near Albuquerque, New Mexico. This report documents the completion of two of these assigned tasks: (1) identification, evaluation, and recommendation of appropriate remedial technologies, which includes a preliminary investigation of the effect of natural fate and transport processes on shallow groundwater volatile organic compound (VOC) plume behavior and possible exposure potential at the site, and (2) a conceptual design of the recommended remedial approach.

This report is organized to clearly document the development of the recommended remedial alternative. Background information, including historical information and a summary of the nature and extent of contamination at the site, provides a basis for identifying the range of alternatives to consider for implementation. Several remedial technologies, which are effective in removing VOC contamination, are described briefly. A series of remedial technology evaluation criteria are used to identify promising technologies for the Person Generating Station site. Technologies surviving this screening process are incorporated into a final recommended remedial alternative for the site, which is to be implemented in two distinct phases.

The recommended groundwater remedial alternative--a combined source removal and pump-and-treat approach--is then investigated more fully with respect to long-term effectiveness and required duration to achieve desired cleanup levels. A three-dimensional fate and transport model based on available site data is used to investigate the possible behavior of the shallow groundwater VOC plume under three different groundwater remediation scenarios. Because of physical and chemical limitations, pump-and-treat technologies will not remove all of the VOC contamination in the shallow groundwater. Some level of groundwater contamination, which depends on the nature and duration of pump-and-treat activities implemented at the site, will remain in the aquifer to naturally attenuate through dispersion, hydrolysis, biodegradation,

sorption, and volatilization into the vadose zone. The groundwater flow model MODFLOW was coupled to the contaminant transport model MT3D to predict the position and concentrations in the plume following 9 years of pump-and-treat activities using 5 wells, and 6 years of pump-and-treat activities using 4 wells. All model data are calibrated using recent groundwater data. The results from these modeling runs are used to identify any potential migration to receptors, and to estimate the potential risk to human health and the environment from implementing any of the remedial alternatives under consideration.

1.2 BACKGROUND INFORMATION

The following sections describe the history of the site leading up to and following the discovery of the VOC contamination and relevant site characteristics, including the nature and extent of VOC contamination in both soil and shallow groundwater media.

1.2.1 Site History and Description

The specific characteristics of the Person Generating Station site, including source of contamination and other relevant physical aspects of contaminated media, will drive the identification and ultimate selection of appropriate remedial technologies and supporting fate and transport modeling.

1.2.1.1 Operational History

The Person Generating Station site, which was operated and maintained by the Public Service Company of New Mexico (PNM), is located in the Albuquerque Basin, a physiographic drainage basin in the middle part of the long Rio Grande Valley which extends northward through the length of New Mexico (Kelley, 1977). Interstate 25 is located approximately 1000 feet to the east (see Figure 1.1).

The Person Generating Station site included a maintenance area to support, among other activities, equipment cleaning efforts. The parts wash area included a sump and a below-grade, vertically-placed 3.5' x 10' cylindrical waste oil storage tank located on the north side of the site to collect wastes generated during equipment cleaning.

Liquid wastes collected in the sump were piped approximately nine feet to the below-grade waste oil tank. Historical records and interviews with retired personnel indicate that waste oils and greases, kerosene, a water-trisodium phosphate mixture used in steam cleaning, Stoddard Solvent, Dowclene EC, and other solvent mixtures generated during maintenance activities were piped into the tank for storage (METRIC, 1993). Dowclene EC is a generic solvent with two primary active ingredients: 1,1,1-trichloroethane (1,1,1-TCA) and tetrachloroethene (PCE). Records suggest that major use of the Dowclene EC product began in 1979. Equipment repainting activities conducted in 1980 generated a new type of liquid effluent, including waste paint, paint thinners, and turpentine, that also was collected in the waste oil tank. Maintenance personnel noted when the tank appeared to be full and arranged for various waste oil reclaimers to remove the contents and recycle the material at other locations.

The tank was apparently in use from about July 1976 until October 13, 1983, when it was discovered that the tank lacked an impermeable bottom (i.e., the tank bottom