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21 February 2001

Mr. Jeff Perry
Anoka County Parks
1350 Bunker Lake Blvd.
Andover, MN 55304

Subject: Executive Summary of Proposed Pilot-Scale Test of Vegetable Oil Injection for the *In-Situ* Bioremediation of Chlorinated Solvents in Groundwater at Anoka County Park, Fridley, Minnesota

Dear Mr. Perry:

Parsons Engineering Science, Inc. (Parsons ES) is pleased to submit this executive summary for a proposed pilot-scale test to remove chlorinated solvents in groundwater beneath Anoka County Park (ACP) near the Naval Industrial Reserve Ordnance Plant (NIROP) in Fridley, Minnesota. The purpose of the pilot-scale test is to evaluate the feasibility of using enhanced *in-situ* bioremediation as a technology to remove the chlorinated solvents from groundwater at ACP and adjacent areas including the NIROP facility.

Application of this technology will involve injecting vegetable oil beneath the groundwater table to stimulate natural biodegradation of the chlorinated solvents as a means for cleaning up the groundwater. Vegetable oil injection has been used to stimulate biodegradation of chlorinated compounds at six other sites across the country, including sites in Florida, Tennessee, Delaware, Utah (two sites), and California. If the pilot-scale test is successful, this technology could be implemented in full-scale in the future to reduce or cleanup contaminants in groundwater beneath ACP and the adjacent areas. This technology is preferred for the park area in particular because it is less intrusive than other traditional cleanup technologies, such as pump and treatment, which require piping and construction of treatment facilities.

This project is being conducted by Parsons ES, CH2MHill Constructors, Inc., and Southern Division, Naval Facilities Engineering Command. We are seeking the county's approval to proceed with this project and continue the effort to develop a solution for groundwater cleanup beneath ACP. Figure 1 is an aerial photograph showing the location of the proposed pilot test. The technical aspects of the project are discussed below.

The design of the proposed pilot-scale test is based on review of the March 2000, *1999 Annual Monitoring Report, Naval Industrial Reserve Ordnance Plant (NIROP), Fridley, Minnesota* (Tetra Tech NUS, Inc., 2000) and the April 2000 *Field Investigation Report at the NIROP and Anoka County Riverfront Park, Naval Industrial Reserve Ordnance Plant (NIROP), Fridley, Minnesota* and discussions between Parsons ES, CH2MHill Constructors, Inc., the United States Environmental Protection Agency (USEPA), the



Minnesota Pollution Control Agency (MPCA), Anoka County Parks, TechLaw, Inc., Tetra Tech NUS, Inc., the Minnesota Department of Health (MDH), and Southern Division, Naval Facilities Engineering Command.

Site-specific activities in support of the enhanced bioremediation field application will include:

- Installation of three (3) vegetable oil injection wells, nine (9) groundwater monitoring wells, and three (3) contingency monitoring wells. All wells will be completed with above-grade well casings. A detailed schematic of the well layout is shown on Figure 2 and a schematic of the well design is shown on Figure 3;
- Baseline (i.e., pre-injection) sampling of groundwater at the newly installed injection wells, groundwater monitoring wells, contingency monitoring wells, and existing wells MS-46S, 27S, and MS-47S in accordance with the *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater* (U.S. Environmental Protection Agency [USEPA], 1998);
- Pre-injection aquifer testing (hydraulic conductivity) of the three (3) injection wells and six (6) monitoring wells using slug tests;
- Plumbing of the three (3) injection wells and injection of up to 3,600 gallons of food-grade vegetable oil (1,200 gallons per well);
- Injection of bromide (aqueous phase) into the three (3) vegetable oil injection wells for determining zones of influence of the injected oil;
- Post-injection aquifer testing (hydraulic conductivity) of the previously-tested three (3) injection wells using slug tests;
- Surveying of the newly installed injection and monitoring wells by a professional surveyor;
- Post-injection sampling of groundwater and vegetable oil (if present) at the newly installed monitoring and injection wells, in accordance with the *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater* (USEPA, 1998) at two (2), six (6), and 12 months after injection; and
- Preparation of a report detailing the results of the field application.

During the field activities, trees, trails, and other park features will be protected and any wastes generated (e.g., drill cuttings) will be removed from the park and disposed of in accordance with federal, state, and local regulations. During drilling, the work area will be secured by barricades and caution tape. All wells will be installed in accordance with state regulations. The final well layout may vary from what is shown in Figure 2 as a result of information discovered during the field program. A variance will be obtained from MDH prior to injecting bromide or vegetable oil into the aquifer.

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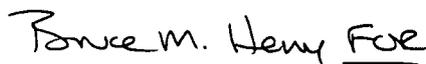
The materials and methodologies to accomplish these activities will be described in detail in a work plan being prepared by Parsons ES. The work plan will include an introduction, a review and analysis of available, previously reported, site-specific data, an overview of biodegradation of chlorinated solvents, a description of system installation, the procedures to be followed for data collection, the quality assurance/quality control (QA/QC) measures to be used during this project, and a description of the final report. The work plan also will include a contingency to oxygenate groundwater downgradient of the vegetable oil injection sites, if needed, to mitigate generation of vinyl chloride during the pilot test.

It is anticipated that the pilot-scale test will be completed one year after system installation. The drilling, testing, oil injection, and sampling activities will require that contractors have access to the site at various times throughout the year.

We appreciate your review of this executive summary. Please feel free to contact me or Mary Stauffer at Parsons ES in Denver (303.831.8100) if you have any questions.

Sincerely,

PARSONS ENGINEERING SCIENCE, INC.



Todd Wiedemeier
Technology Leader



Mary Stauffer
Project Manager

cc: Venky Venkatesh, CH2MHill Constructors, Inc.
Joel Sanders, Southern Division, Naval Facilities Engineering Command
Mark Sladic, Tetra Tech NUS, Inc.

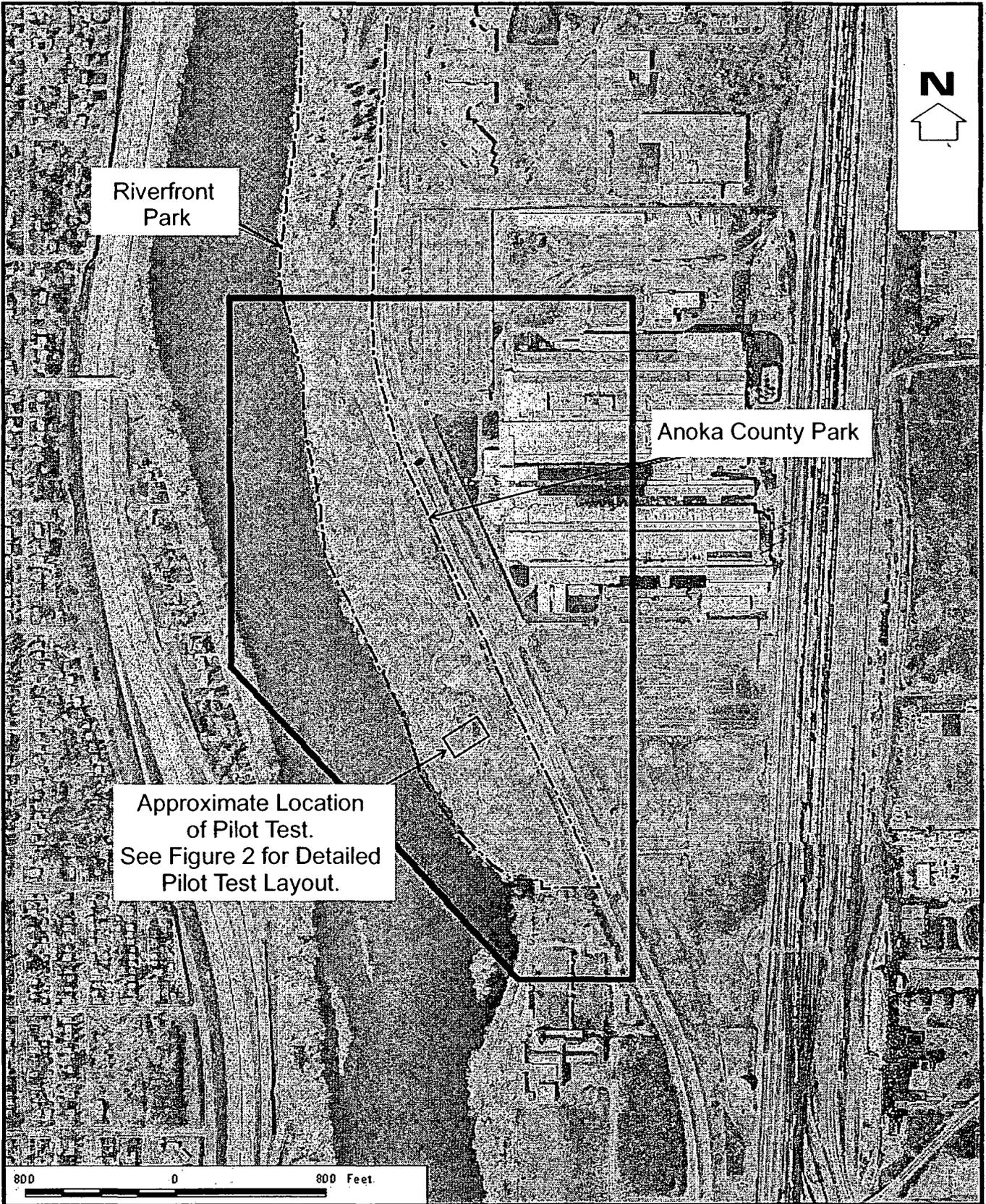
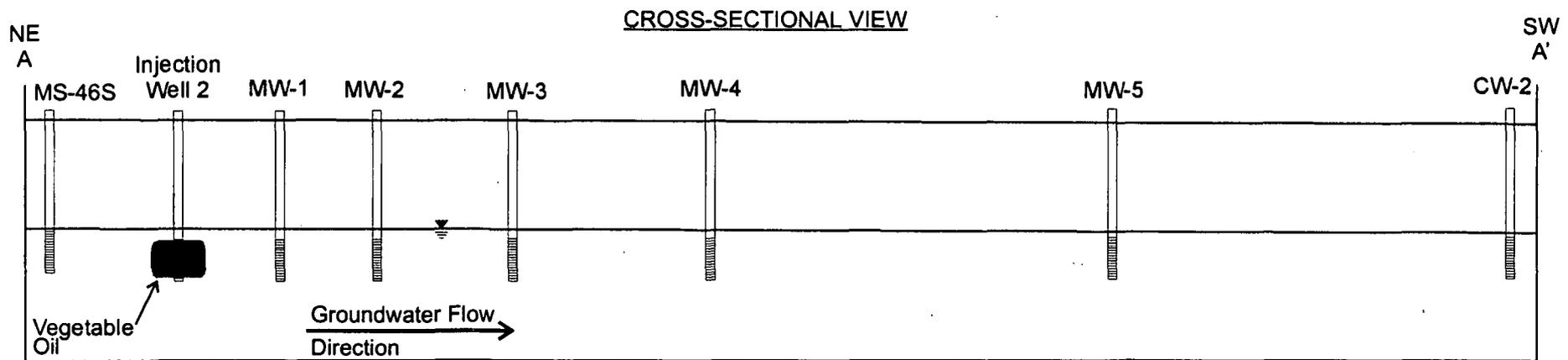
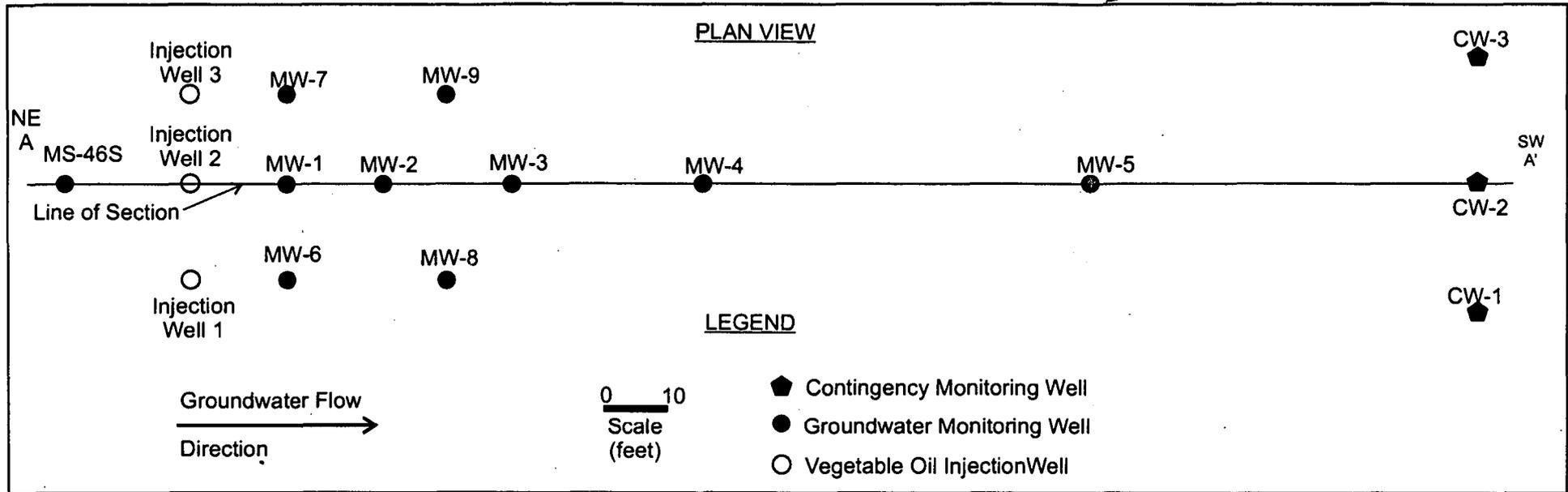


FIGURE 1
LOCATION OF VEGETABLE OIL
INJECTION PILOT TEST

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Area Outlined on Figure 1



0 10'
Horizontal Scale

0 10'
Vertical Scale

FIGURE 2
VEGETABLE OIL INJECTION PILOT
TEST SYSTEM LAYOUT

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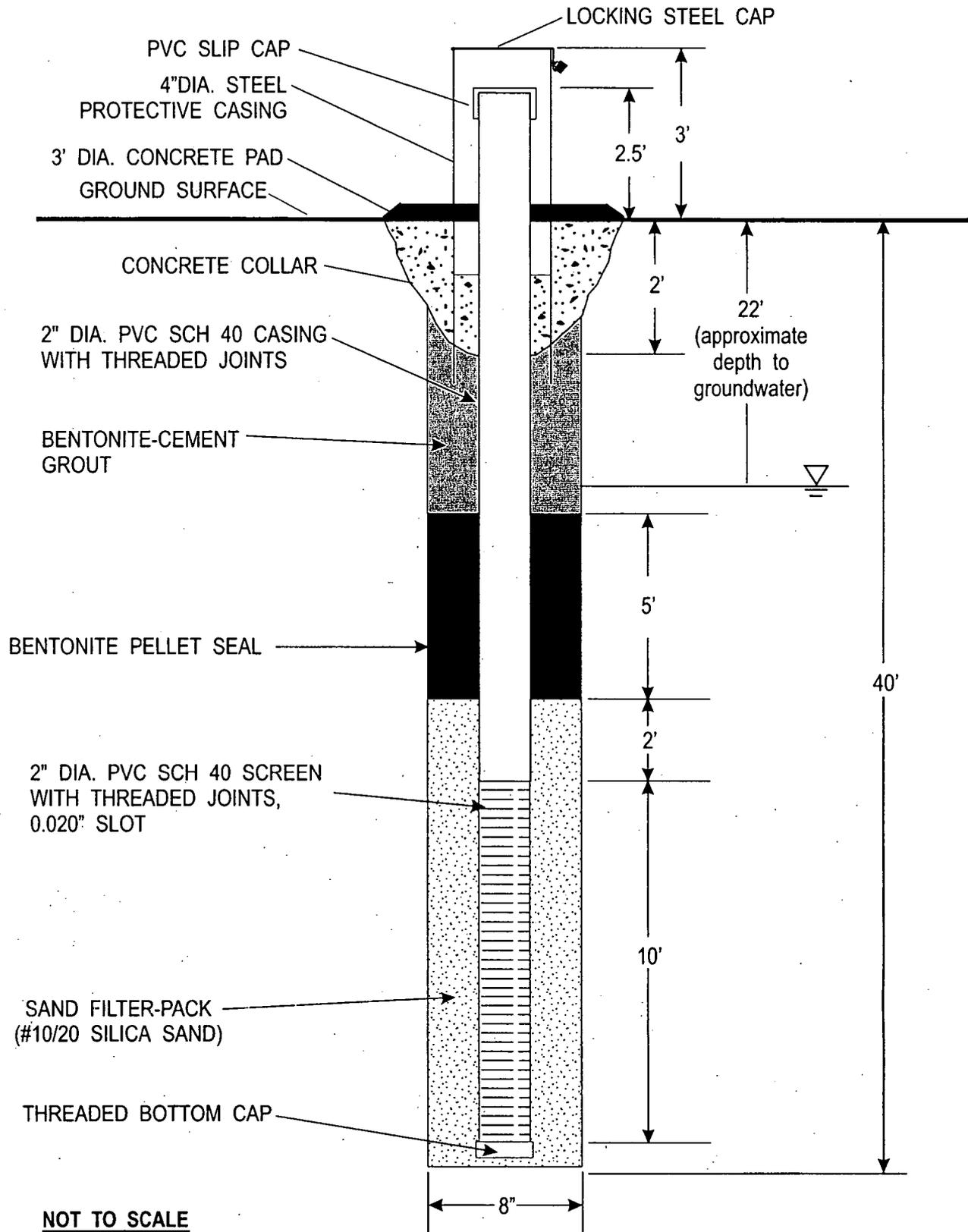


FIGURE 3
 VEGETABLE OIL INJECTION AND
 GROUNDWATER MONITORING WELL
 CONSTRUCTION DETAIL

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