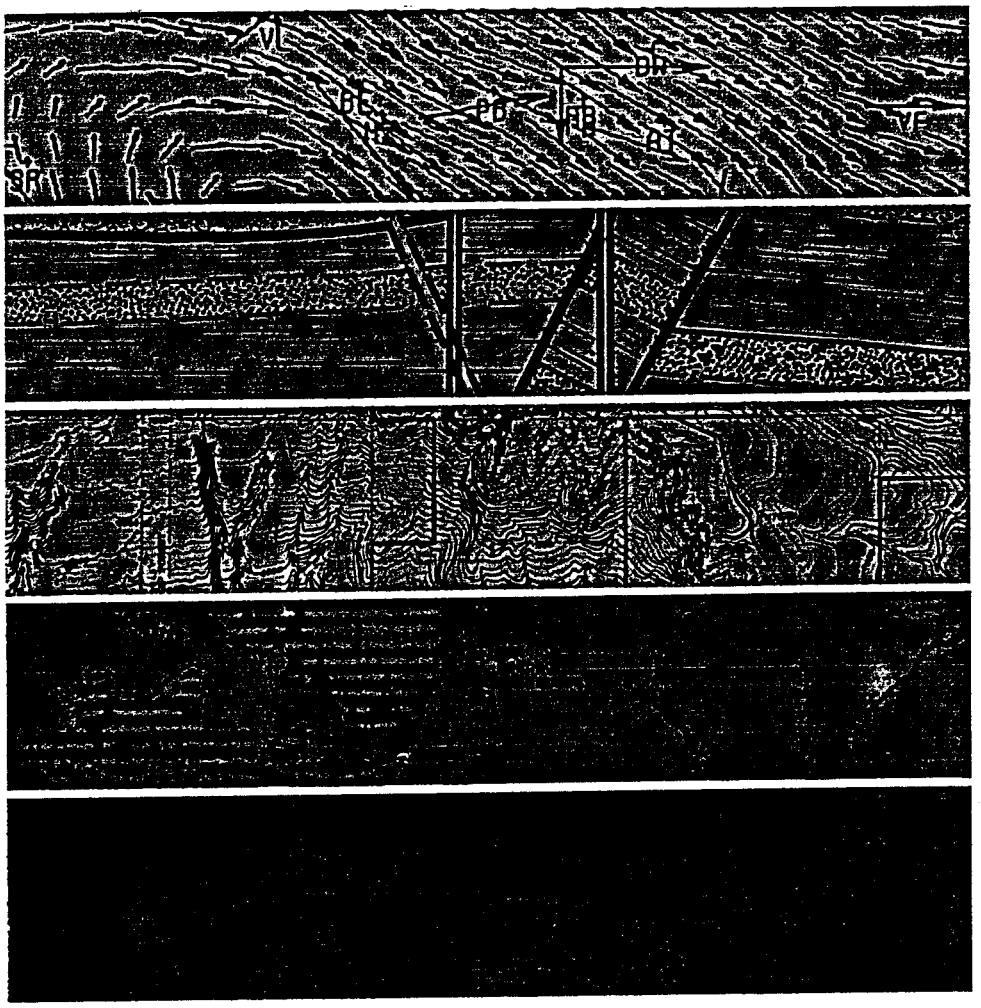

Monitor Well Installation Plan

May, 1989

Command Airways
Wappingers Falls, NY

DAMES & MOORE

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MONITOR WELL LOCATION AND INSTALLATION

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MONITOR WELL LOCATION AND INSTALLATION

1.0 Introduction

Dames & Moore has been retained by Command Airways to conduct an investigation of the subsurface conditions at the Command Airways leased property at Dutchess County Airport in Wappingers Falls, NY (hereafter called the site).

An Underground Storage Tank (UST) which collected waste water from the floor drain in the Command Airway hangar is suspected to have contributed to groundwater and soil contamination at the Site. A soil gas survey has been performed at this location. The results of this survey indicated some potential sources of contamination. The report based on the soil gas survey is included as attachment A with this monitor well installation plan.

2.0 Monitor Well Installation

Nine (9) groundwater monitor wells will be installed to identify shallow and possible deep contamination in the groundwater. The wells will also support the distribution of the contamination suggested by the soil gas survey. The proposed locations of the monitor wells are illustrated on Figure 1.

Groundwater flow direction is typically perpendicular to and towards surface water bodies and down topographic gradients. At the site, the inferred groundwater flow direction is to the northwest (figure 1). Four (4) wells will be located upgradient of the UST. Two (2) wells will be located across gradient and three (3) wells will be placed downgradient of the UST. Well clusters will be installed to help distinguish the vertical distribution of contamination. The spacing is designed to maximize the groundwater information collected in a cost-effective manner.

Three well clusters are to be installed. This is the minimum number necessary to provide reliable groundwater gradient information. Each well cluster will consist of one shallow well (approximately 25' depth) and one bedrock well (approximately 75' depth) (figure 1).

(1d)

- One well cluster will be placed upgradient of the UST to monitor the groundwater entering the site.

- One well cluster will be placed downgradient of the UST to monitor the groundwater after it has traversed the site and;

- One well cluster will be placed cross gradient to triangulate with the other wells and provide up or downgradient information should groundwater flow direction be different than expected.

The remaining 3 wells will be placed in the upper aquifer for more detailed information on where higher levels of contamination may exist.

- One shallow well will be placed just southwest of the UST to document soil and groundwater conditions near the tank.

- One shallow well will be placed in the southeast corner of the site to document groundwater entering the site from the south and;

- One shallow well will be placed near the road downgradient of the UST. This well will further verify

(1E)

information gained by the soil gas survey; however, the installation of the well is optional, depending on whether a suitable location can be found.

The monitor wells will be drilled and installed using hydraulic rotary methods. Drill cuttings will be monitored and collected on the ground next to each monitor well and covered with a tarp. The cuttings will be drummed if contamination is evident through physical appearance or if organic vapors are detected above background levels by a photo-ionization detector. Based on these guidelines, the decision to drum the cuttings will be made in the field by a Dames & Moore Project Geologist. Water will be used as the drilling fluid and as a method of cooling the drill bit. The borehole will be cased to prevent cave-ins during installation of each well and the casing will be withdrawn in small increments as the sand filter and impervious seal are emplaced. In addition, the casing will minimize the potential for cross contamination between the overburden and bedrock aquifers.

During drilling, soil samples will be collected at five foot intervals using standard split spoon sampling techniques in accordance with ASTM Specification D-1586. The soil samples taken will be classified based on the Unified Soils Classification System by the Dames & Moore geologist in the field. Each sample will be field screened using a photo-ionization detector to identify the presence of organic

(1f)

vapors. One sample from each boring will be selected for subsequent laboratory analysis for the Volatile Organic Compounds. One sample from the well screened interval will be analyzed for grain size distribution, Atterberg limits and moisture content.

The bedrock-soil interface will be defined from information in literature or blow counts greater than or equal to 100 blows per six inch advance of the split spoon. When bedrock is encountered a NX bit and core barrel will be used to advance the boring, approximately 10 feet into bedrock. Prior to well installation, the rock portion of the boring will then be enlarged to approximately 3 1/2 inches by spinning the casing into the rock and washing out the borehole with a tricone roller bit. The monitor well construction will consist of 2 inch PVC pipe and screen, with 0.020 inch slots in the screened interval. Each section of pipe will be threaded and no glue will be used to join adjacent segments of the pipe. The well screen will be approximately 10 feet in length. The shallow monitor wells installed will be screened at the first water bearing zone encountered and the screen will extend approximately one foot above the water table. The monitor wells installed in the bedrock will be screened from the top of the bedrock to ten feet below. A sand pack will be placed around the screened interval and up to one foot above the top of the screen. Above this, a bentonite pellet seal two feet in length will be placed. A cement-bentonite grout

using tremie methods then will be installed to the surface. A protective pipe or curb box will be installed around the monitor well. The monitor wells will be installed according to NYSDEC specifications. Figure 2 and 3 show the typical proposed well constructions for the shallow and bedrock monitor wells, respectively. Each well installation will be described on the boring log and a schematic diagram will be prepared on-site by the field geologist showing the details of the installation.

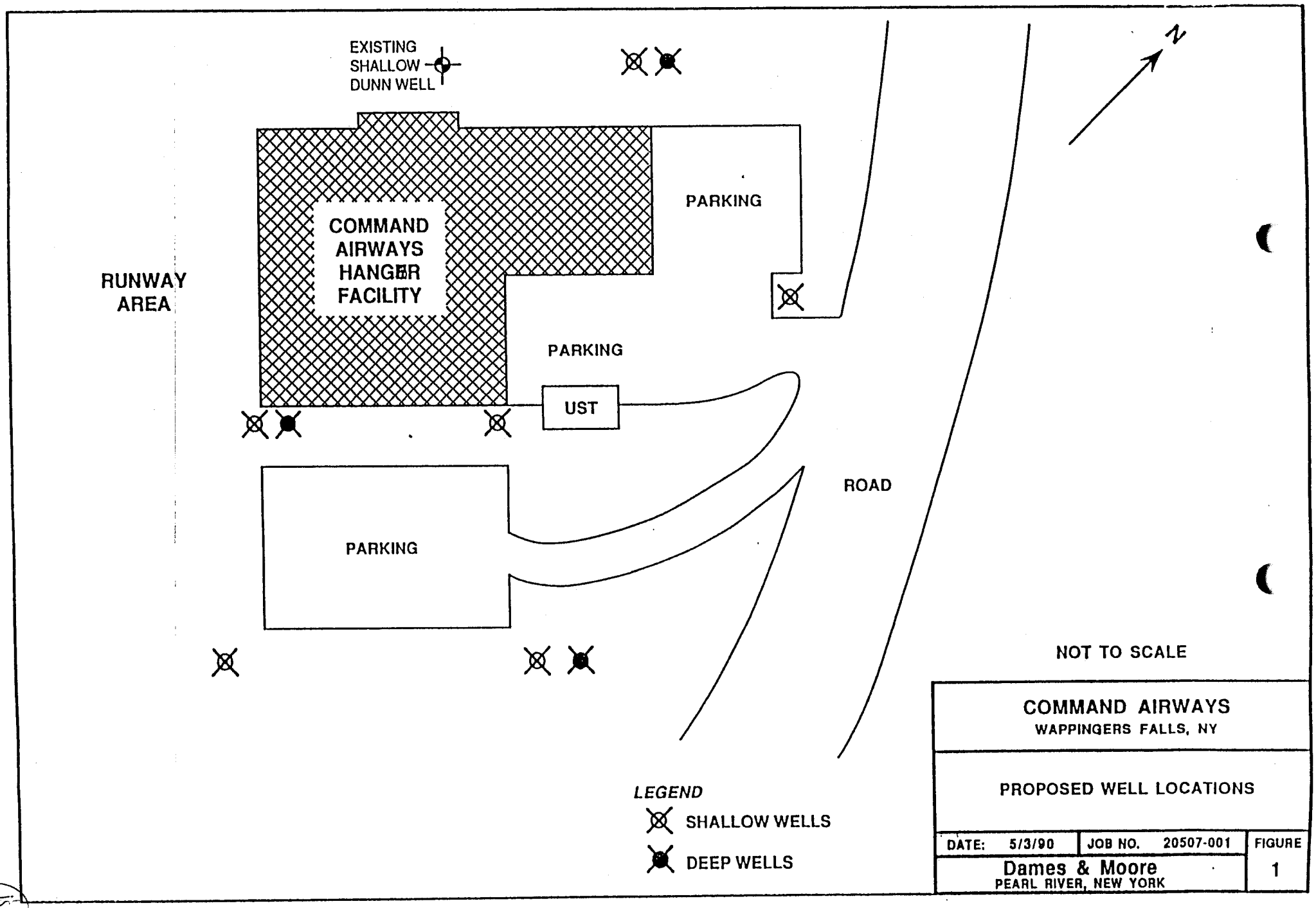
The drilling equipment will be steam cleaned between monitor well clusters. The split spoons will be decontaminated with a phosphate-free detergent followed by a potable water rinse between samples. After installation of the monitor wells, each well will be developed. Development water will be discharged to the ground in a manner that prevents ponding. Each well volume will be monitored for pH, temperature, specific conductance, and turbidity. When the ground water reaches 50 NTUs turbidity or less, development will be considered to be completed. However, it should be noted that due to natural subsurface soil conditions, 50 NTUs turbidity may not be attainable no matter how long the well is pumped. If so, a modified development procedure will be developed and implemented.

After development, a slug test will be performed on each well and the results of the tests analyzed. Based on the results of these tests, the hydraulic conductivity

(permeability) of the monitored units will be calculated. Three (3) rounds of water table measurements will be made over the course of the Phase II investigation to allow for the preparation of needed water table maps.

Each monitor well and test boring location will be surveyed as to the location and elevation. The surface elevations and elevations of the inner casing of each well will be surveyed to the nearest 0.01 foot by a licensed land surveyor.

A groundwater sampling plan, specifying groundwater constituent monitoring requirements and frequency is under preparation, as is a health and safety plan to be implemented during drilling operations.


EXISTING
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SHALLOW WELLS
DEEP WELLS
COMMAND AIRWAYS
WAPPINGERS FALLS, NY
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FIGURE
1
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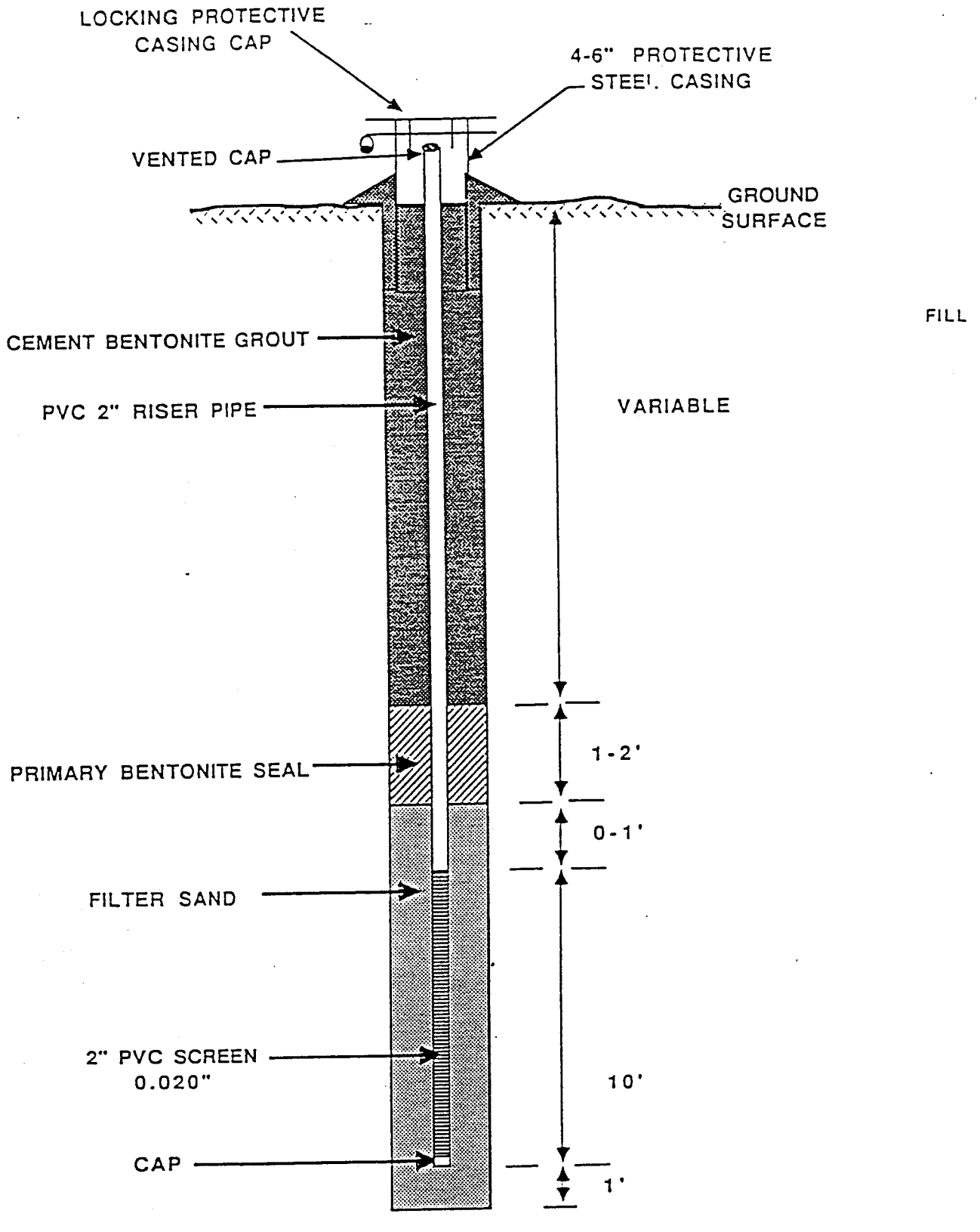
PEARL RIVER, NEW YORK



TYPICAL MONITORING WELL CONSTRUCTION IN SHALLOW MATERIAL

(NOT TO SCALE)

DAMES & MOORE
FIGURE 2

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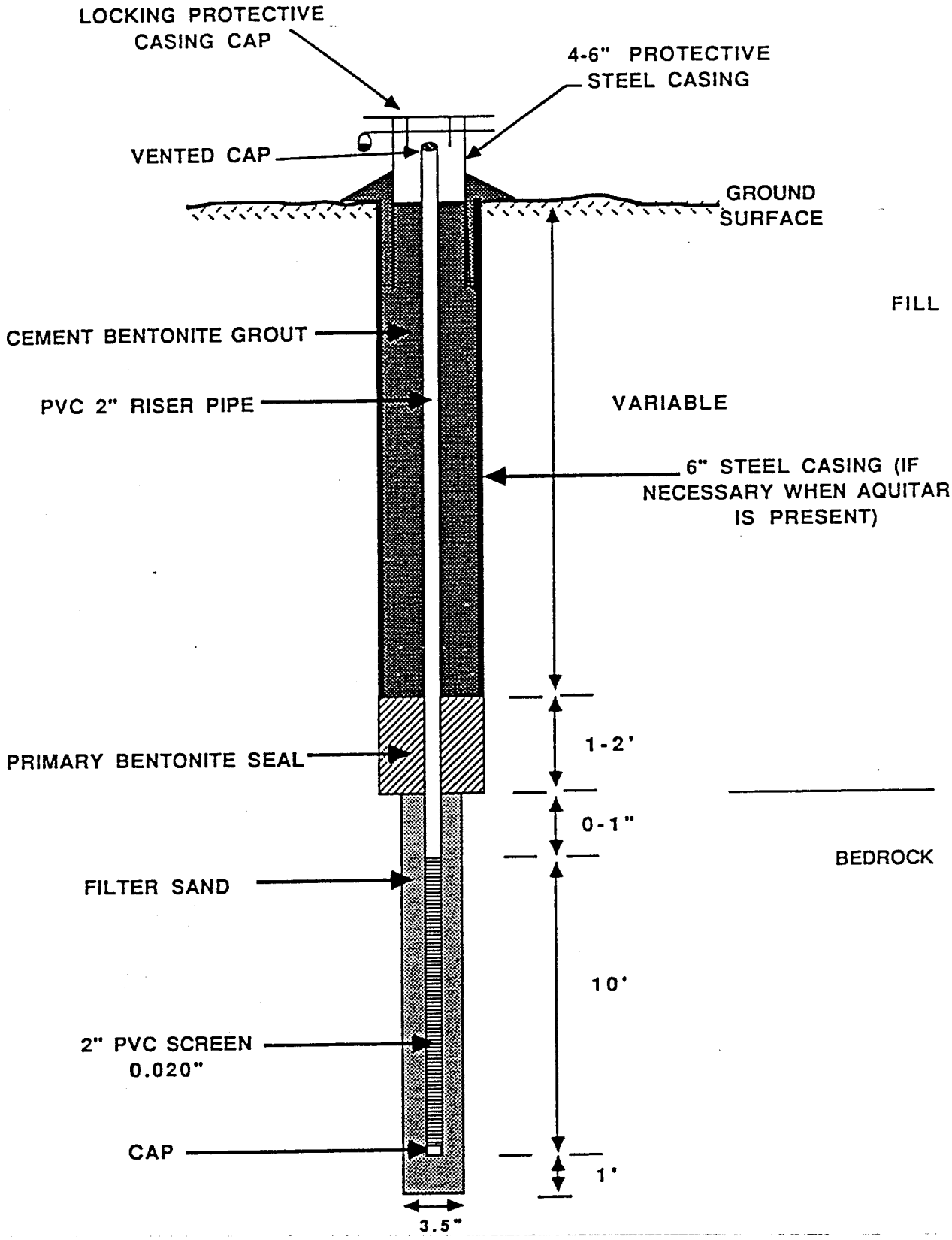

TYPICAL MONITORING WELL CONSTRUCTION IN THE BEDROCK

(NOT TO SCALE)

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FIGURE 3

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