Memorandum

GROUNDWATER SCIENCES CORPORATION

To: fYNOP Technical Team

From: Steve Snyder

Date: January 16, 2015

Re: Near Source Soil Gas Vapor Point Installation

The attached Figure 1 explains the dimensions and boring method for near source soil gas (NSSG) vapor point installation to be installed during the completion of Addendum 15 of the Field Sampling Plan for Part 2 of the Groundwater Remedial Investigation (GSC, April 2012). The following steps will be taken to complete the installation:

1. The depth of the bottom of the boring will be established by determining the equilibrated water table in the temporary well point or final monitoring well paired with the vapor point to be installed. The depth will be determined by subtracting 5 feet plus the height of the capillary zone. The capillary zone will be determined by referring to Table 10 of the J&E Users Guide (attached), which provides a calculated height of the capillary zone based on the soil texture.
2. Three to five undisturbed samples will be collected from the boring. The undisturbed samples will be collected from zones based on the geologist's log and laboratory analyses from the adjacent paired well boring. Zones selected for undisturbed sampling are;
    a. 8' below the ground surface, representing the zone below basement level in adjacent homes,
    b. the zone representing the finest textured soils,
    c. the zone immediately below the deepest extent of the augers, representing the capillary zone.
    d. Depending on the depth of the boring one or two additional samples could be spaced throughout the boring to characterize materials penetrated.
3. The boring will be completed using 4.25" I.D. hollow stem augers to a depth to be calculated using Figure 1, such that the deeper of two NSSG vapor points is installed above the water table in an 18" glass bead pack, and the second point is installed 10 feet higher (10 feet between the top of the lower permeable pack and the upper permeable pack). The lower portion of the boring is made using the dual tube soil sampling system through the augers.
4. Volumes of materials (sand pack and grout zones) will be calculated, and sounded for verification.
5. Grout with 5% bentonite will be required because the zones to be sealed will be above the water table, and therefore are potentially subject to dehydration and cracking. Grout will be a consistency that will pour through a tremie pipe, and will

not penetrate the sand pack (six [6] gallons of water per bag of Portland cement). A small amount of choke sand and bentonite pellets could be used above the lower sand layer to prevent grout penetration. Above the top of the grout layer between the lower and upper vapor point, choke sand and bentonite pellets will also be placed. Similarly, above the top of the upper sand, choke sand and pellets will be used to prevent grout from penetrating the sand pack. Bentonite pellets will be hydrated for approximately 30 minutes prior to installing the next layer.

6. Care must be taken to positively identify shallow versus deep implant tubing.
7. The top hole will be finished with a flush-mounted driveover cover as described in Addendum 15.

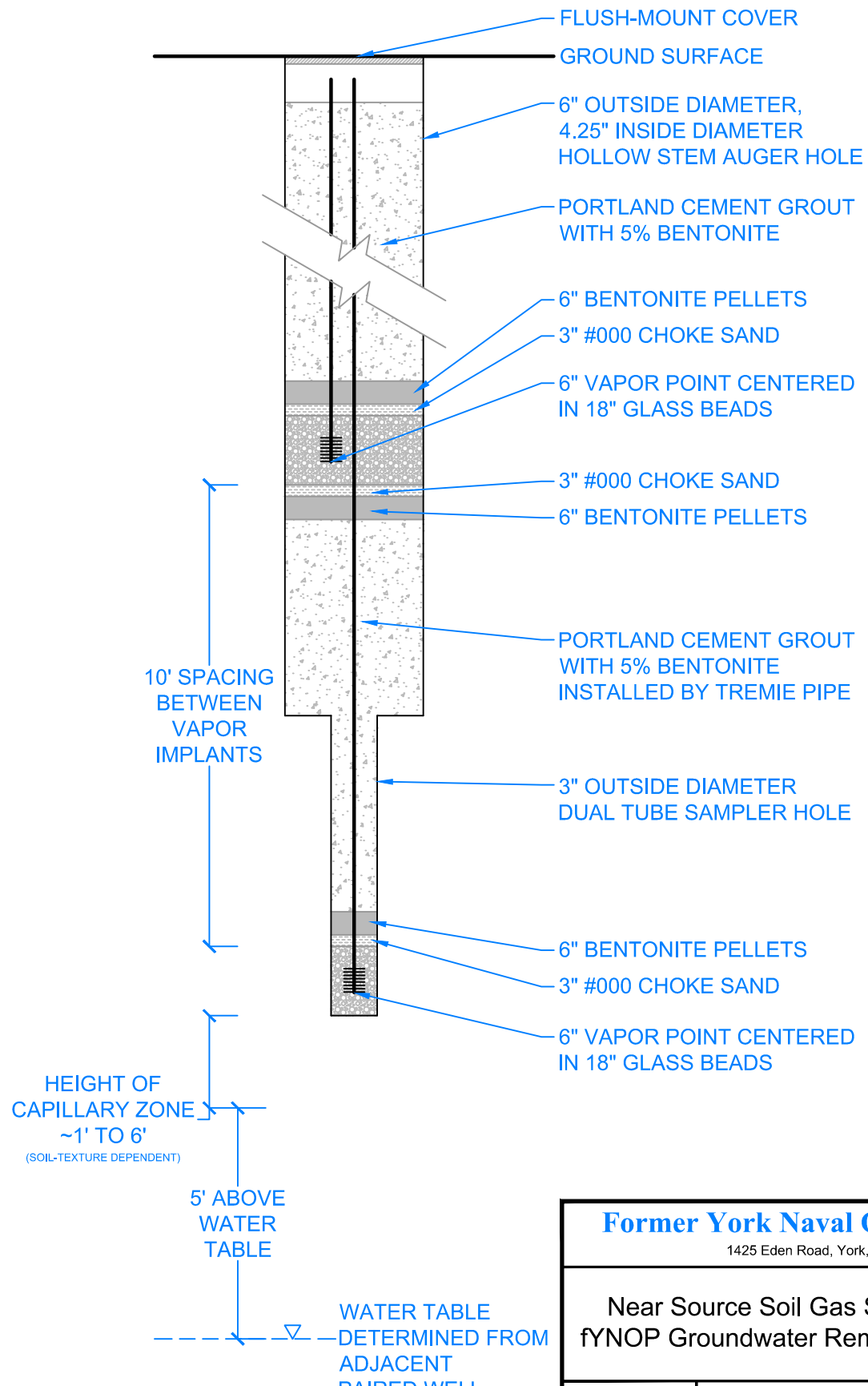

Figure I

Former York Naval Ordnance Plant

1425 Eden Road, York, PA 17402

Near Source Soil Gas Sample Implants
fYNOP Groundwater Remedial Investigation

DRAWN BY: JPB	CHECKED & APPROVED BY: SMS	DATE: 12/18/2014

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