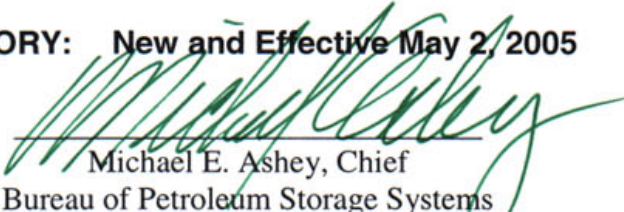


DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF PETROLEUM STORAGE SYSTEMS
PETROLEUM CLEANUP PROGRAM


STANDARD OPERATING PROCEDURES PCS-005

GROUNDWATER SAMPLING STANDARD OPERATING PROCEDURES
VARIANCES AND CLARIFICATIONS FOR BUREAU OF PETROLEUM
STORAGE SYSTEMS SITES

HISTORY: New and Effective May 2, 2005


Michael E. Ashe, Chief
Bureau of Petroleum Storage Systems


Michael J. Bland, P.G.
Chief Geologist


Diane D. Pickett, P.G.
Assistant Chief Geologist

An updated (revision date February 1, 2004) Groundwater Sampling Standard Operating Procedures (DEP-SOP-001/01, FS 2200 Groundwater Sampling) became effective on June 8, 2004 for the Florida Department of Environmental Protection (FDEP) by reference in the Quality Assurance rule, Chapter 62-160, Florida Administrative Code (the web link is: <ftp://ftp.dep.state.fl.us/pub/labs/assessment/sopdoc/2004sops/fs2200.doc>). The Bureau of Petroleum Storage Systems (BPSS) has embraced the Groundwater Sampling Standard Operating Procedures (SOP) with the exception of a few minor variances. This memo states those variances and clarifies many of the issues that have surfaced since the June 8, 2004 implementation date for the Groundwater Sampling SOP.

A. Variances

1. The Groundwater Sampling SOP allows for continued purging if the stabilization parameters are not within acceptable limits after purging five well volumes. If equipment volumes are being used to determine purging completion and the stabilization parameters are not within the acceptable limits, then the Groundwater Sampling SOP also allows for continued purging after a total of five well volumes of the screened interval have been removed. Unless otherwise approved by the BPSS prior to the groundwater sampling event, the BPSS will require sampling to be performed after purging a maximum of five well screen volumes (equipment volume purging) or five water well volumes. When using equipment volume purging, stabilization of the water level must be achieved before the first set of stabilization parameters are measured and the water level must be stable during the entire time that the five well screen volumes are being removed. In addition, for equipment volume purging, the pump or tubing should be placed within the middle of the screened interval, and the

stabilization parameters must be measured no sooner than 2 to 3 minutes apart or every volume of the well screen interval (whichever is less).

2. For water-table (shallow) wells, the pump or tubing intake must be placed in the top two feet of the water column and not at the middle of the saturated portion of the screened interval as described in the SOP. If it is not possible to place the electric submersible pump within the top two feet of the water column due to the need to maintain a sufficient amount of water column above the pump motor, then the electric submersible pump should be placed in the upper part of the water column as close as possible to the water table while maintaining a sufficient water column above the pump motor. The SOP also states in Section 3.4.1.1 of FS 2212 that the pump or tubing intake should be placed within the screened interval for wells that previously and consistently purged dry. The BPSS will require as a variance from the SOP that the pump or tubing be placed in the top two feet of the water column in the shallow wells that have historically purged dry (the pump or tubing should be lowered in the well to match the drawdown that is occurring during the purging).
3. Currently, the SOP does not permit sampling of PAHs and TRPHs after the sample has passed through the silicone tubing on the peristaltic pump head. If a peristaltic pump is used with silicone tubing, then according to the SOP the PAHs and TRPHs must be collected into an intermediate sampling device (the vacuum trap method) or with a bailer after the well is purged with the peristaltic pump. The vacuum trap method increases the amount of time for sampling and is sometimes difficult to maintain a vacuum and prevent aeration of the sample due to leaks in the tubing connections. The SOP does not recommend the use of a bailer. As a variance to the SOP, the BPSS will allow, at this time, sampling of PAHs and TRPHs after the peristaltic pump head. The silicone tubing has to be disposed of between wells and limited to a small section (≤ 1 foot) just around the pump head. This variance does NOT apply to sampling of volatiles, which still must be sampled in accordance with the SOP.
4. If a water level probe can not be placed in a micowell during purging due to the small diameter of the well, then the depth to water readings collected during the purging of the well should be recorded to the nearest 0.5 foot interval on the Groundwater Sampling Log. The depth to water readings can be estimated by the amount of discharge tubing lowered in the well if drawdown is occurring during purging. Stabilization of the water level drawdown must be shown before stabilization parameters are measured to demonstrate purging completion.
5. Although strongly discouraged, the BPSS will allow the use of bailers for purging and sampling as long as the use of the bailers is conducted according to the requirements outlined in Section 4 of FS 2213 and Section 2 of FS 2221 of the Groundwater Sampling SOP. This includes the raising and lowering of the bailer in the water column at a maximum rate of 2 cm/sec. Table FS 2200-3, "Allowable Uses for Bailers," states that bailers can be used for purging "if operated by a skilled individual with documented training in proper techniques." In DEP SOP FA 1000, the quality systems requirements (Section FA 3000) state that applicable training of personnel be documented and that management ensure adequate training. It is not the intent of the BPSS to require formal certification of bailer training. The

person performing the bailing should, however, be able to demonstrate that he or she has received proper bailer training and is knowledgeable in proper bailer use.

6. The BPSS encourages the use of disposable tubing instead of decontaminating the tubing in the field in order to prevent cross-contamination and to decrease the amount of time required for purging and sampling of wells. All tubing should be transported to the site in a protective cover to prevent the possibility of cross-contamination. Rolled tubing that is obtained directly from the manufacturer and is transported to the site in a protective cover will not be required to be cleaned by the consultant prior to placing in the well. Tubing that is not disposed of after its use will be required to be cleaned as outlined in the Sample Tubing Decontamination Procedures (FC 1160) of the SOP.
7. The updated (revision date February 1, 2004) Groundwater Sampling SOP includes a revised Groundwater Sampling Log (Form FD 9000-24). The updated (revision date February 1, 2004) Groundwater Sampling Log must be used when sampling wells at BPSS sites. Form FD 9000-24 should be entirely filled out and modifications to the form should not be made.

B. Clarifications

1. The Groundwater Sampling SOP has often been misinterpreted to infer that drawdown is not allowed during purging. This is not the intent. FS 2213, Section 2.1.6 states “Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.” The driving force of this statement is to ultimately make the purging rate and the recovery rate equilibrate so that the drawdown is stabilized, and this does not mean that some drawdown is not acceptable. As purging is initiated, some drawdown is expected until an equilibrium is reached between the purging rate and the well recovery rate, which is the point at which drawdown is considered stabilized or minimized. The best procedure to purge a well that has not been previously sampled is to start purging at a relatively slow rate and increase the flow rate gradually until the highest purging rate is achieved that will not cause drawdown. Purging at a slower rate is allowable, but purging at a higher rate that causes continued drawdown is not allowable, unless the pumping rate is the lowest possible for the pump. If the well has previously been sampled, then the purging rate can be determined from the water sampling log form for the previous sampling event.
2. For sites that are in the preapproval program, the BPSS has received requests from environmental consultants for additional compensation to sample vertical extent wells due to the depth of the wells. Just because a well is deep is generally not a valid reason why additional compensation to sample the well is needed. FS 2212, Well Purging Techniques, Section 2.2, allows for the use of equipment volumes instead of well volumes for calculating the volume of water to purge from wells with a fully submerged well screen when the pump or tubing is placed within the screened interval, the screened interval is ≤ 10 feet, and the same equipment is used for purging and sampling. This option dramatically reduces the purge volume and thus the time it will take to purge wells that have fully submerged screens.

3. The Groundwater Sampling SOP discusses different purging requirements for fully submerged and partially submerged well screens. For the purposes of sampling at BPSS sites, a well with a partially submerged well screen is considered a water-table (or “shallow”) well, and a well with a fully submerged well screen is considered a vertical extent (or “deep”) well. There are occasions where the screened interval of water-table wells may not intersect the water table. Examples of this situation are when the water table is shallower than two feet below land surface or when fluctuations in the water table bring the water table above the screen. For situations of a shallow water table of less than two feet or if the well screen is submerged by a seasonally high water table, it is important to still define these wells as water-table wells so that the purging described in the Groundwater Sampling SOP for well screens that are partially submerged is followed. The reasons for this are:
 - a. Because the petroleum constituents are generally mostly concentrated at the top of the water table, the BPSS will require water-table wells to be purged and sampled close to the top of the water column where the petroleum is concentrated, not in the middle of the saturated portion of the screened interval as is allowed for fully submerged (vertical extent) wells.
 - b. By classifying water-table wells as having partially submerged screens (even if the water table rises above the screened interval due to seasonal fluctuations), the purging volumes will be calculated by well volumes (which is desirable), not as equipment volumes (as is allowed in the SOP).

If a water-table well is screened in a confined (or semi-confined) aquifer and the water in the well rises above the screened interval, either equipment volume purging or well volume purging techniques may apply, as follows. If the water table is depressed to the top of the screen while purging, the purging requirements for partially submerged screen (shallow) wells (well volume purging) should be used. Otherwise, as long as the well screened interval is less than or equal to 10 feet, the drawdown in the well stabilizes, and the samples will be obtained within the screened interval with the same equipment that was used for purging, the equipment volume purging requirements for the fully submerged screen (deep) wells may be used.

4. As stated in the July 15, 1998 memorandum entitled “New Soil Sampling Procedures and Recommended EPA Analytical Methods and other Quality Assurance Issues for the Division of Waste Management,” equipment blanks and trip blanks are not required unless the results of a sampling event are considered to be questionable (in which case all QA/QC procedures will be followed during the next sampling event) or they are going to be used for site rehabilitation completion. Please note that duplicate samples are no longer part of QA/QC requirements and therefore are no longer warranted under any circumstance.
5. Pursuant to FT 1000 of the SOP, calibration records are required to be kept for all field equipment used. A calibration log (Form FD 9000-8) is included in FT 1000 of the SOP

for recording the calibration data in the field. The BPSS will require that Form FD 9000-8 be filled out for all field equipment used in the gathering of data. This requirement will include all meters utilized for measuring the stabilization of parameters for sampling groundwater or during the collection of field data for pilot testing. Although the SOP does not specifically require that calibration records be kept for OVA instruments, the OVA is an important screening tool that is used during assessments for petroleum contamination; therefore, the BPSS will require that Form FD 9000-8 be filled out whenever an OVA meter is utilized in the field. The OVA calibration must be checked at least twice in the field (at the beginning and end of the field event day) for each day the OVA instrument is used. Copies of the completed Form FD 9000-8 must be included in the report that is submitted to the BPSS summarizing the data.

6. FS 2211, Section 4 states that when determining the water column length in the well you should “not determine the total depth of the well by lowering the probe to the bottom of the well before purging and sampling.” Lowering a tool down a well to determine total well depth can result in the suspension of solids located at the bottom of the well that will affect the turbidity readings, possibly prolonging the time it takes to achieve stabilization of the purging parameters (especially turbidity). The total well depth can be determined from the well construction log or from a previous water sampling log form, and does not have to always be determined from lowering a water level probe to the bottom of the well. If the total depth of the well needs to be determined for future sampling events, it can be measured after the purging and sampling activities are completed. If it is not practical to delay gauging the well depth until after the sampling event, then a 24-hour delay between gauging the well depth and the purging activities is recommended.

MEA/ddp