

BROWARD COUNTY
ENVIRONMENTAL PROTECTION DEPARTMENT (EPD)
MINIMUM CRITERIA FOR MONITORING WELL INSTALLATION AND SAMPLING

Revised, February 2007

Failure to follow these criteria, or to obtain approval for variation to these criteria, is a citationable offense and bears an associated civil penalty, as provided in Section 27-38(h) (9), of the Broward County Code for Pollution Control.

GENERAL

1. Monitoring wells shall be installed in accordance with the following criteria. Any deviation from these installation or construction designs for a monitoring well must be pre-approved by the EPD. All requests must be submitted to the EPD a minimum of seven (7) business days prior to well installation.
2. EPD representatives shall be permitted access to the monitoring wells, at reasonable hours during and after construction, for the purpose of inspection and/or sampling.
3. A South Florida Water Management District (SFWMD) form 0124 (Well Completion Report) must be completely filled out for each monitoring well, and a copy submitted to the EPD.
4. 72-hour advanced written notification (e-mail and facsimiles are acceptable) of well drilling and/or groundwater or soil sampling is required.
5. All wells shall be installed by a State of Florida licensed water well contractor.
6. All necessary state and local permits must be obtained prior to beginning the work.
7. Equipment, tools, materials, etc. shall be decontaminated, prior to the beginning of the work and prior to each well installation, by such procedures as steam cleaning and rinsing with clean water or distilled water to prevent possible introduction of contaminants in the wells during construction. If the area is known, or believed, to be contaminated, a decontamination solution appropriate for the contaminate of concern shall be used. All decontamination shall take place over a nonporous surface. If a nonporous surface is not available, all decontamination liquids must be contained for proper disposal.
8. In most cases, hollow stem augers should be used for the installation of permanent or temporary shallow (less than 20 ft. deep) monitoring wells. However, in some cases, it may be necessary to use mud rotary or direct push technology (DPT) to install the wells; advance notice in writing must be given to EPD prior to the use of either technology. Deep monitoring wells (more than 20 ft. deep) should be installed with double casing.
9. If the water table is less than 2 feet below surface and/or if the presence of free product is suspected, it is recommended that a temporary piezometer be installed.

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The piezometer should not have more than 5 feet of screen and the screened interval must intersect the water table; the whole length of the annular space can be backfilled with native sediments.

10. The monitoring wells shall be properly developed. After the grout has been allowed to cure, the development of the wells can be completed by surging, over-pumping, surge-blocking, or some other method approved by EPD. The monitoring wells should yield water that is free of sediment, organic debris, and drilling contaminants.
11. All development water and/or drill cuttings impacted by a contaminant (as defined in Section 27-352, Broward County Code) must be properly stored in clearly labeled, product tight drums kept in containment, to prevent further spread of contaminants.
12. Within 45 days of collection, all contaminated development water and/or drill cuttings must be disposed in an environmentally safe manner, and disposal manifests submitted to the EPD.

The completed monitoring wells (except temporary wells and piezometers) shall be surveyed at the top of casing (measuring point on north side of casing) and concrete pad with reference to either the National Geodetic Vertical Datum (N.G.V.D.) elevations or as described in the Florida Department of Environmental Protection (FDEP) Chapter 62-770.600(4)(k), Florida Administrative Code, (F.A.C.).

PERMANENT MONITORING WELL CONSTRUCTION SPECIFICATIONS

1. Prior to well installation, a survey to locate all underground utilities at the site must be completed.
2. Before the drilling of each well is initiated, hand augering or posthole must be initiated for the top four (4) feet below the land surface, in order to determine if utilities are present at the location of the drilling.
3. The outer diameter of the hollow stem auger shall be at least six (6) inches in diameter if a 4- i n c h casing is to be installed, and at least four (4) inches in diameter if a 2- i n c h casing is to be installed. A minimum 2-inch filter pack annulus is required for both cases.
4. The monitoring well(s) shall be two (2) inch or four (4) inch in diameter with threaded joints. The monitoring well casing shall be constructed of stainless steel, P.V.C. (schedule 40 minimum) or approved equal. The installation of 1 inch diameter, pre-packed monitoring wells (micro wells), using DPT, will be considered by the EPD on a case-by-case basis.

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5. Shallow monitoring wells shall have a well screen that is two (2) inch or four (4) inch diameter with a preferred slot size of 0.010-inch; if a slot size of 0.020-inch or higher is installed, a coarser sand pack must be used. The American Society for Testing and Materials (ASTM) D 5092-90 recommends that the slot size should retain at least 90% (and preferably 99%) of the sand pack. The well screen should be set at least two (2) feet above the normal annual high water table and at least three (3) feet below the annual low water level.
6. Deep monitoring wells shall have a five (5) feet long screen. The screened interval should be determined based on lithology and site-specific information such as concentrations detected at the shallow monitoring wells. For double-cased wells, a minimum of 2-inch annular space between casings is recommended and the top of the well screen must be a minimum of 2 feet below the outer casing.
7. Solvents or P.V.C. glue shall not be used. P.V.C. threaded/slip couplings may be secured using stainless steel screws or rivets. Care should be exercised to ensure that the stainless steel screws do not protrude inside the well casings.
8. The monitoring well casing shall be installed true vertical in the drilled bore hole. If horizontal or inclined monitoring wells need to be installed, the EPD will consider this on a case by case basis.
9. A clean washed sand pack shall occupy the annular space from the bottom of the bore hole to one (1) foot above the well screen. The ASTM D 5092-90 recommends the use of sand with a grain size that is about four to ten times greater than the d-30 (30% finer) grain size of the hydrologic unit being filtered. Use of a filter sock in lieu of a sand pack is not acceptable.
10. The use of fine clean washed sand, instead of clay (hydrated bentonite) which tends to bridge the annulus, is preferred to create a seal (6-inch thick) above the annular space pack material to avoid grout migration into the pack. The remaining annular space between the casing and the bore hole shall be grouted with neat cement or with a cement/bentonite mix (up to 6% bentonite by weight).
11. Permanent monitoring wells shall be constructed in such a way that they are not prone to surface water infiltration or located in low areas that experience repeated flooding.
12. The well-heads of the permanent monitoring wells should be constructed to be in a best-protected manner, whether they be metal casing type cover flushed with the ground with bolted down covers and set in a concrete pad which is sloped away from the well to prevent surface infiltration, or with protective containment such as standup metal well-casing.

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13. The top of the permanent monitoring wells shall be sealed with a water tight locking cap. The well shall be kept locked at all times to prevent tampering.
14. All permanent monitoring wells shall be adequately labeled to distinguish them as monitoring wells and shall be properly secured to prevent vandalism and/or the accidental introduction of contaminants.
15. Abandonment of permanent monitoring wells must conform with the "plugging" requirements described in FDEP Chapter 62-532.500(4), (F.A.C.), and in SFWMD Rule 40E-3.531(3) for well abandonment. Specifically, all wells must be pressure-grouted from bottom to top with neat cement grout and the work must be completed by a licensed water well contractor. A Well Abandonment Report must be prepared and submitted to EPD, and a copy filed with the SFWMD, within 30 days of well abandonment.

TEMPORARY MONITORING WELL CONSTRUCTION SPECIFICATIONS

16. Temporary monitoring wells (TMWs) are wells used for collecting groundwater samples for screening purposes.
17. Prior to installation of a temporary well, a survey to locate all underground utilities at the site must be completed. TMWs can be installed using a hollow stem auger or DPT. A clean washed sand pack shall occupy the annular space from the bottom of the bore hole to one (1) foot above the well screen.
18. A bentonite seal, cement grout and manhole cover are not necessary for TMWs; but a water tight locking cap is required.
19. Abandonment of temporary monitoring wells must conform with the plugging requirements described in FDEP Chapter 62-532.500(4), (F.A.C.), and in SFWMD Rule 40E-3.531(3) for well abandonment. Specifically, all wells must be pressure-grouted from bottom to top with neat cement grout and the work must be completed by a licensed water well contractor. TMWs must be abandoned within seven (7) days of receiving analytical data for the groundwater samples collected.

SAMPLING

1. All groundwater sampling must follow the procedures listed in the latest version of Department of Environmental Protection Standard Operating Procedures for Field Activities, DEP-SOP-001/01, FS 2200 for groundwater sampling. This document is available at <http://www.floridadep.org/labs/qa/sops.htm>.
2. All sampling will be performed by a laboratory or a geotechnical or engineering consulting firm certified by the State of Florida. The laboratory must also hold

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National Environmental Laboratory Accreditation Program (NELAP) certification from the Florida Department of Health's Environmental Laboratory Certification Program (DoH ELCP). Out-of-state laboratories must be either certified by DoH, or be NELAP certified by another state with secondary accreditation by DoH.

3. Use groundwater purging and sampling equipment constructed of only non-reactive, non-leachable materials that are compatible with the environment and the selected analytes. In selecting groundwater purging and sampling equipment, give consideration to the depth of the well, the depth to groundwater, the volume of water to be evacuated, the sampling and purging technique, and the analytes of interest. DEP-SOP-001/01 does not recommend using bailers for purging unless no other equipment can be used or purging with a bailer has been specifically authorized by EPD. Use a bailer if there is free floating product (FFP) in the well or if FFP is suspected to be in the well. If in doubt about the appropriateness of using a bailer at a site or during a particular sampling event, contact the appropriate EPD project manager.
4. All analyses will be performed by a NELAP Certified laboratory.
5. All groundwater samples shall be collected from the permanent monitoring wells no sooner than 24 hours after well development using a peristaltic pump. Temporary wells and piezometers must be sampled only once, immediately after installation and purging, and then properly abandoned (see item four, Temporary Monitoring Wells Construction Specifications). Before beginning sampling, the well casing shall be purged 3 to 5 volumes of water using a peristaltic pump and pH, temperature, dissolved oxygen, turbidity and specific conductance measured to determine stabilization. The water column inside the well must be a minimum of 2 feet high in order for the sampling to proceed. Groundwater samples must be collected within 6 hours of well purging. The use of quiescent sampling techniques, as defined in Chapter 62-770.200(28), F.A.C., is allowed if turbidity will affect the analyses of total metals. If the presence of liquid phase petroleum hydrocarbons is suspected, then the air/water interface should be examined, using an interface probe or a bailer, for presence of FFP. If FFP is present and exceeds a thickness of 0.1 foot, then no further samples for dissolved contaminants should be attempted and the presence of product (thickness in inches) should be reported in lieu of an analysis. Groundwater samples collected below the water/FFP interface may, in some cases, be necessary for remedial system design. If FFP is present and the thickness is less than 0.1 foot, then the FFP should be removed by any of the recovery methods specified in Chapters: 62-770.300(1)(b), 62-782.500(2)(b) or 62-785.500(2)(b) and the groundwater sampled as per Section 3, FS 2200, DEP-SOP-001/01. All FFP recovered must be properly stored, disposed and manifested.
6. All groundwater samples must be collected from the least contaminated well first

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with the most contaminated well to be sampled last. All water samples must be unfiltered. Filtered samples analyses will not be reviewed.

7. If soil samples need to be collected, the samples shall be collected so that they are representative of the contaminated soils and in accordance with Chapter 62-770.600(4) (c), (d), and (e); the FDEP "Guidelines for Assessment and Source Removal of Petroleum Contaminated Soil," May 1998, and the "Soil Assessment and Sampling Methods for Florida Bureau of Petroleum Storage System Sites," (Standard Operating Procedures PCS-004), effective October 1, 2001, for petroleum contaminated soils; and with Chapter 62-782.600(5)(c) and (f) or Chapter 62-785.600(5)(c) and (f) for non-petroleum contaminated soils.
8. All sample analyses reported to EPD will be construed as valid and representative samples in that all QA procedures were followed and sample holding times were not exceeded.
9. "Hard-copies" of the actual laboratory test results must include:
 - a. Copy of the completed Chain of Custody (COC) form submitted for each sampling event (see attached copy of COC and Instructions).
 - b. Name of person (with affiliation) who collected the sample.
 - c. Date of sample collection.
 - d. Date of extraction.
 - e. Date analysis was completed.
 - f. Signature of the analyst or other responsible laboratory official.
 - g. Test method used for the analysis (e.g. EPA Method 8210).
 - h. Detection limits for all laboratory data. Detection limits must be no higher than federal, state or local water standards and/or guidance concentrations, whichever is most stringent.
 - i. In the case of sludge, soil, etc., the test results should indicate whether the data are on a wet or dry weight basis. EPD prefers all such test data on a dry weight basis or to receive both dry and wet basis along with the percentage of water content.
 - j. The units of measurement (e.g. ppb or ppm).