United States
Environmental Protection
Agency

Office of
Waste Programs Enforcement
Office of Solid Waste and
Emergency Response

EC-G-2002-130

Solid Waste

EPA

RCRA Ground-Water Monitoring Technical Enforcement Guidance Document

RCRA GROUND-WATER MONITORING
TECHNICAL ENFORCEMENT GUIDANCE DOCUMENT
(TEGD)

SEPTEMBER 1986

casings, well screens, filter packs, and annular seals or backfills. Figure 3-1 is a drawing of a typical ground-water monitoring well. The following sections describe various acceptable materials the owner/operator should have used in constructing the well as depicted in Figure 3-1.

3.2.1 Well Casings and Well Screen

A variety of construction materials have been used for the casings and well screens, including virgin fluorocarbon resins (i.e., fluorinated ethylene propylene (FEP), polytetrafluoroethylene (PTFE), Teflon®), stainless steel (304, 316, or 2205), cast iron, galvanized steel, polyvinyl chloride (PVC), polyethylene, epoxy biphenol, and polypropylene. Many of these materials, however, may affect the quality of ground-water samples and may not have the long-term structural characteristics required of RCRA monitoring wells. For example, steel casing deteriorates in corrosive environments; PVC deteriorates when in contact with ketones, esters, and aromatic hydrocarbons; polyethylene deteriorates in contact with aromatic and halogenated hydrocarbons; and polypropylene deteriorates in contact with oxidizing acids, aliphatic hydrocarbons, and aromatic hydrocarbons. In addition, steel, PVC, polyethylene, and polypropylene may adsorb and leach constituents that may affect the quality of ground-water samples.

The selection of well casing and screen materials should have been made with due consideration to geochemistry, anticipated lifetime of the monitoring program, well depth, chemical parameters to be monitored and other site-specific factors. Fluorocarbon resins or stainless steel should be specified for use in the saturated zone when volatile organics are to be determined, or may be tested, during a 30-year period. In such cases, and where high corrosion potential exists or is anticipated, fluorocarbon resins are preferable to stainless steel. An example of a stainless steel monitoring well is provided in Figure 3-2. National Sanitation Foundation (NSF) or ASTM-approved polyvinylchloride (PVC) well casing and screens may be appropriate if only trace metals or nonvolatile

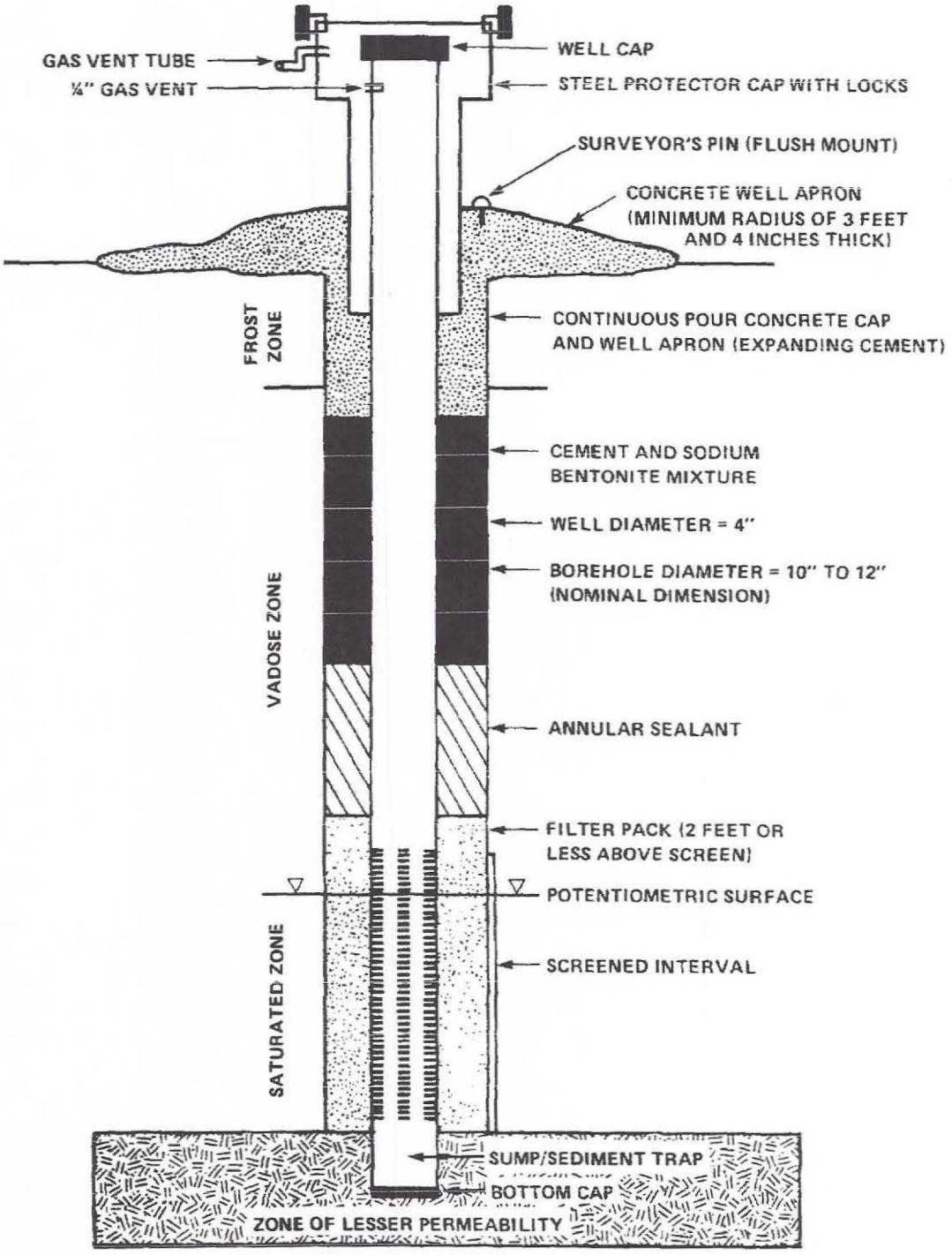

FIGURE 3-1. GENERAL MONITORING WELL – CROSS SECTION

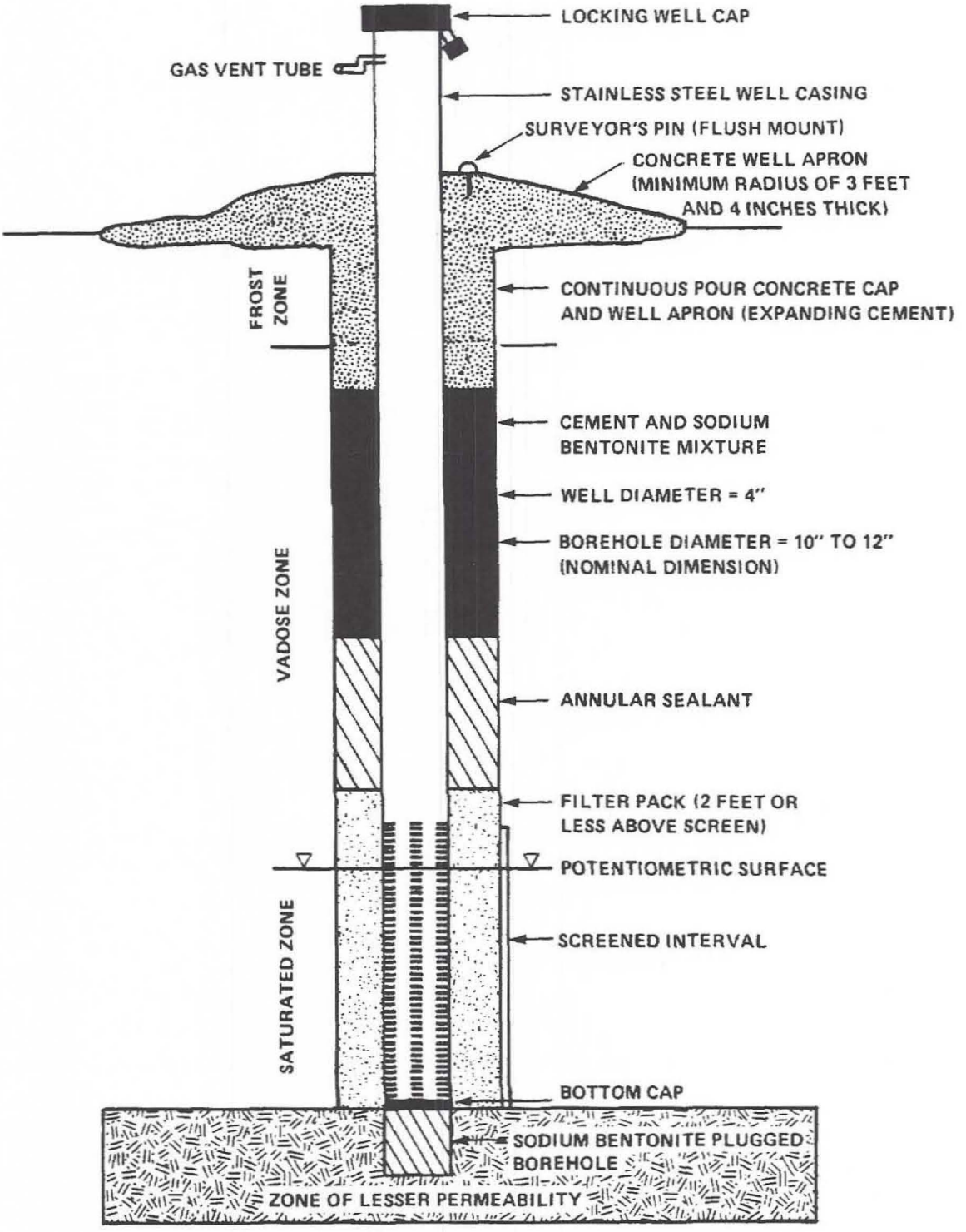

FIGURE 3-2 GENERAL STAINLESS STEEL MONITORING WELL – CROSS SECTION

organics are the contaminants anticipated. As research demonstrates the appropriateness of other materials for screens or casing in the saturated or vadose zones, they may be utilized on a site-specific basis. Stainless steel, fluorocarbon resins, or PVC are appropriate casing materials in the unsaturated zone.

Figure 3-3 illustrates the concept of a composite well. Many combinations of materials may be employed in a manner consistent with this guidance. One combination that should be avoided is the use of dissimilar metals, such as stainless steel and galvanized steel, without an electrically isolating (dielectric) bushing. If such dissimilar metals are in direct contact in the soil, a potential difference is created and leads to accelerated corrosion of the galvanized steel (in this example). More generically, in the Galvanic series the less noble metal becomes the anode to the more noble metal and is corroded at an accelerated rate. In well construction, this acceleration in corrosion at the point of connection will lead to failure of the construction materials and loss of a RCRA monitoring well. Theoretically, a potential difference is created in one type of metal penetrating heterogeneous strata, but the difference in potentials would not be as great. In conclusion, a dielectric coupling should be used for connecting dissimilar metals in either the saturated or vadose zone.

There are two reasons why owners/operators should have selected appropriate well screen and casing materials:

- Long term structural integrity, i.e., 30 or more years, is essential to the collection of unbiased ground-water samples over the active life of the facility and post-closure period.

- Owner/operators of facilities whose Part B or post-closure permit application has been called are required under 270.14(c)(4) to analyze any plume(s) for Appendix VIII constituents (see the RCRA Ground-Water Monitoring Compliance Order Guide, August 1985). The remainder of facilities must monitor for Appendix VII constituents. Well construction materials should not bias the collection and analysis of low concentrations of hazardous constituents by reacting with the ground-water samples.

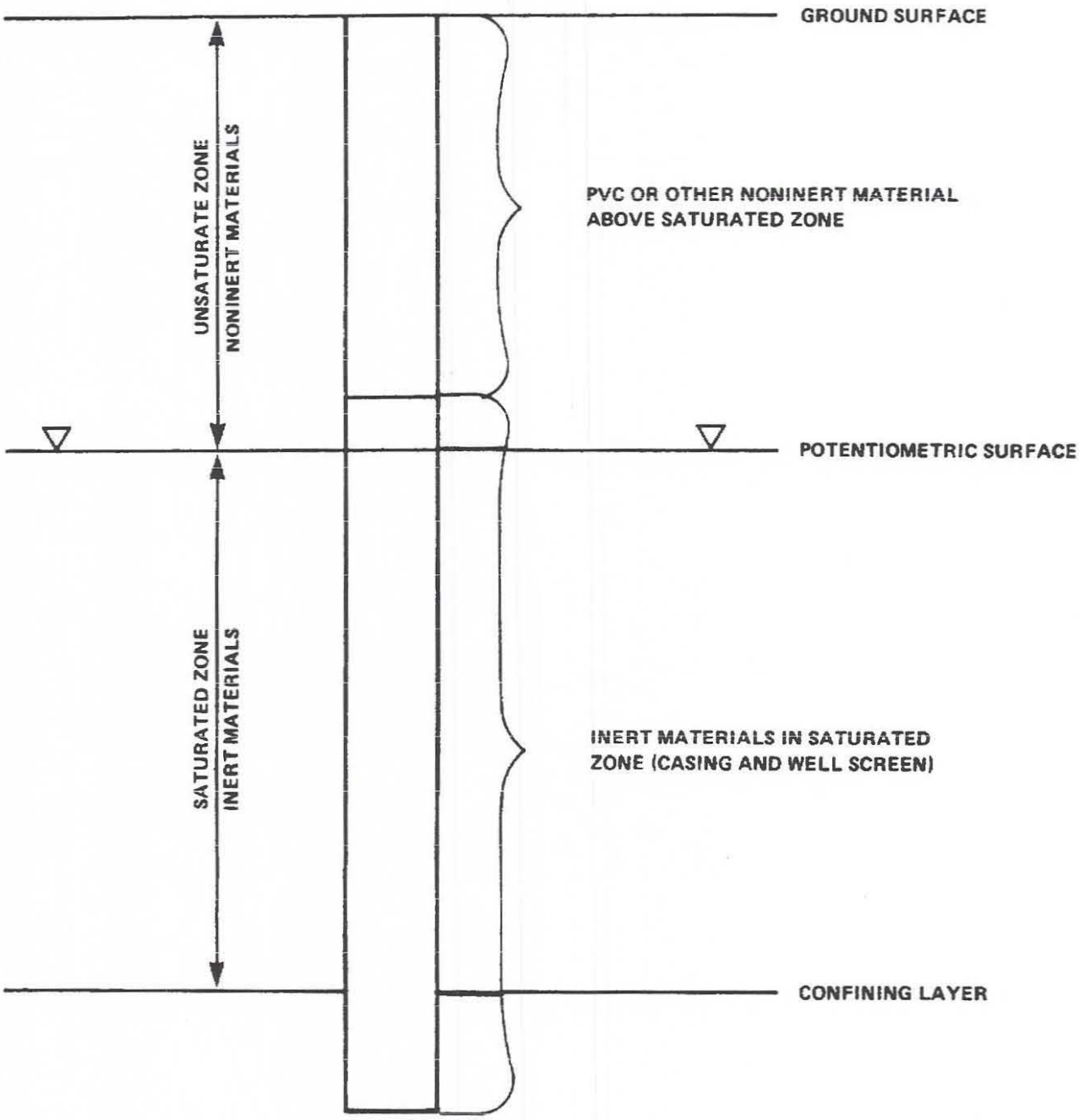

FIGURE 3-3. COMPOSITE WELL CONSTRUCTION
(INERT CONSTRUCTION MATERIALS IN SATURATED ZONE)

Plastic pipe sections must be flush threaded or have the ability to be connected by another mechanical method that does not introduce contaminants such as glue or solvents into the well. Also, monitoring wells must be structurally sound in order to withstand vigorous well development procedures. Well casings and screens should be steam cleaned prior to emplacement to ensure that all oils, greases, and waxes have been removed. Because of the softness of casings and screens made of fluorocarbon resins, these materials should be detergent-washed, not steam-cleaned, prior to installation.

The owner/operator should normally use well casing with either a two-inch or four-inch inside diameter. Larger casing diameters, however, may be necessary where dedicated purging or sampling equipment is used or where the well is screened in a deep formation.

The installation of a sump (sampling cup device) at the bottom of a monitoring well (Figure 3-1) is recommended. The sump will aid in collecting fine-grain sediments and result in prolonging the operating life of the screen. An extra benefit of using a sump is its ability to capture intermittent dense-phase contaminants for analysis. In zones composed of fine-grained material (clays and silts) where turbidity may be problematic, the decision flow chart (Figure 3-4) for turbid ground-water samples should be consulted to evaluate well construction and development.

3.2.2 Monitoring Well Filter Pack and Annular Sealant

The materials used to construct the filter pack should be chemically inert (e.g., clean quartz sand, silica, or glass beads), well rounded, and dimensionally stable (see Section 3.3 for more detail on well intake design). Fabric filters should not be used as filter pack materials. Natural gravel packs are acceptable, provided that the owner/operator conducts a sieve analysis to establish the appropriate well screen slot size and determine chemical inertness of the filter pack materials in anticipated environments.