

**Second Ad Hoc Committee on Florida Hydrostratigraphic Unit Definition;
Possible Modifications Needed if the Committee
Decides to Adopt the ASTM Guidelines
(July 2007, by R. Copeland)**

Introduction

As you are aware, there are four major issues that the Committee has not been able to resolve. They have been presented to you previously as Issues 5a, 5b, 6, and 7.

Issue (5a) - In portions of Florida where relatively thin, semi-confining to confining material lies below the SAS and above the FAS, it is to become part of the SAS.

Issue (5b) - In portions of the state where the SAS sands overlie the semi-confining/confining material of the IAS, the sands are to be included into the SAS.

Issue (6) - In portions of Florida where surficial sands directly overlie the carbonates of the FAS, and where there is no semi-confining/confining material overlying the FAS (i.e., the sands are hydraulically connected to the FAS), the FAS are to be considered "unconfined." What system do the sands belong to? The sands are "homeless" with respect to an aquifer system designation.

Issue (7) - The low-transmissivity material lying at the base of the FAS comprises the top of a sequence are to be informally called "undifferentiated aquifer systems" (all lower case).

The most important issues to be brought up at our August 14 meeting will be the possible adoption by the Committee of the, "Standard Guide for Establishing Nomenclature of Ground-Water Aquifers" published by the American Society for Testing and Materials (ASTM) in 2004. From looking at some of my old notes, the Ad Hoc Committee has previously stated (paraphrased) that, if publications have been written regarding hydrostratigraphic naming and mapping protocols, then the guidelines should be taken seriously by us. Since there currently is a set of national guidelines for hydrostratigraphic nomenclature (the ASTM Guidelines) what reason(s) does the Committee have for not adopting the standard? Other states (Kansas and New Jersey) have already adopted the Guidelines. Also, if the Committee adopts the ASTM Guidelines, do the guidelines adequately address Issues 5a, 5b, 6, and 7?

I believe the guidelines do allow us to resolve our issues. However, there are additional issues that will also need to be addressed. The issues and the possible solutions below represent my opinion. They have either been significant issues of the Committee for some time, or they were brought up at the recent SE GSA meeting in Savannah. It should be noted that most of the Ad Hoc Committee issues that we are dealing with today are a direct result of a publication by Laney and Davidson (1986) and the subsequent ASTM Guidelines.

With these preliminary thoughts in mind, I tried to think of the ASTM guidelines as the “gospel.” Based on what we know about Florida’s hydrostratigraphy, how could we model the hydrostratigraphy of Florida that would fit into the ASTM guidelines model? I believe there are eight topics of concern that we need to address. They are listed below. Think of the issues and my suggestions as a “**straw man**.”

(1) Capitalization. The ASTM article specifically says to not capitalize the terms aquifer, system, and confining unit. It also states that one should not capitalize lithologic modifiers (e.g. Burnam limestone aquifer, not Burnam Limestone aquifer). Although not specifically stated in the ASTM guidelines, I believe the ASTM was significantly influenced by the North American Commission on Stratigraphic Nomenclature. The Commission states that aquifers are economic resources and not lithologic strata. Since they are not lithologic strata, the Commission believes that aquifers are not to be named in the formal sense. Based on these statements, and for the sake of national consistency, we should *keep Florida’s hydrostratigraphic units informal*.

(2) Naming of Hydrostratigraphic Units based on Relative Position. In Florida, the two major units that fall into this category are the surficial aquifer system, plus the intermediate aquifer system or intermediate confining unit (IAS/ICU). The ASTM article specifically states that unit names should not be based on relative position (e.g. upper carbonate aquifer) (p. 700, section 5.2.15.2). However it does state that “entrenched aquifer names” can be used (p. 701, section 5.3.3.6(3) and section 5.3.3.7(1)). In section 5.3.3.7(1), it says, “an aquifer namemay be utilized if the usage of the term is entrenched in an area or has been used in legal terminology.” Also, on page 702 of the ASTM article, it states that, “If (aquifers) are separated at most locations by mappable distinctly less permeable material (confining units) they are two separate aquifers. The terms upper, lower, and so forth may be used where parts of aquifers are separated by confining units and the full extent of the aquifer or aquifer system is reasonably well known.” As examples, the article uses the Upper Floridan aquifer, the Lower Floridan aquifer, and the Middle (Floridan) confining unit.

Because of the statements above, I believe the intent of the ASTM was to go ahead and use entrenched terms, but not clutter the literature with new hydrostratigraphic unit names which are based on inappropriate naming methodologies. With this in mind, *I believe it is justified to continue to use the two terms, “surficial” and “intermediate” in our efforts to name Florida’s hydrostratigraphic units.*

(3) Issues 5a and 5b. First, consider the IAS/ICU boundaries. Where thin semi-confining to confining material directly overlies the FAS and underlies the SAS, the current Committee view is that the material is part of the SAS. However, based on the logic presented below, the semi-confining material needs to be changed and become part of the ICU (right hand side of Figure 1). Where the semi-confining to confining material contains mappable aquifers, then the confining material, along with the aquifers are currently considered to be the IAS (left hand side of Figure 1).

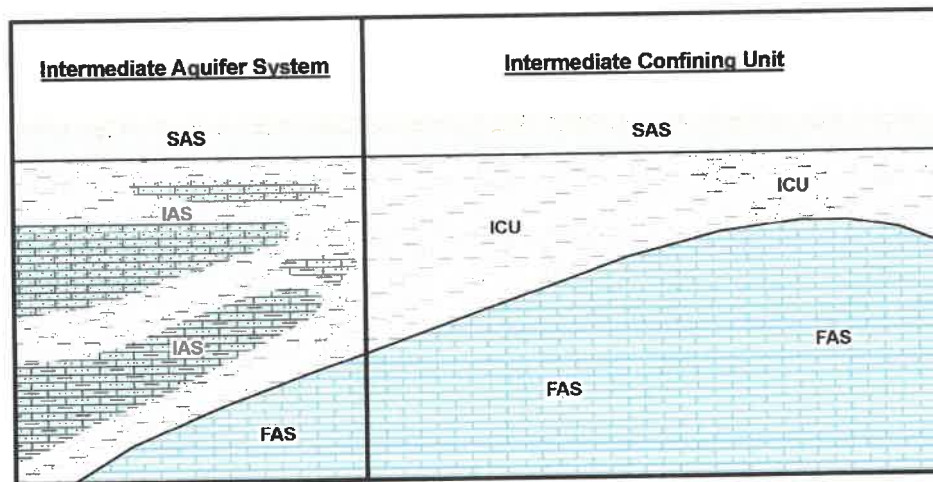


Figure 1.

In a series of examples of aquifers and confining units, the ASTM article (p 704 and 705) consistently states that aquifers have confining units both above and below them. The exception is unconfined aquifers, which only have confining units below them. Using analogous logic, aquifer systems should be separated by confining units. For these reasons, *the confining material in the right hand side of Figure 1 should be part of the ICU.* Also, using the ASTM logic, since on a statewide scale, the “intermediate” acts more as a confining unit than an aquifer system, the IAS is a subset of the ICU. The left hand side of Figure 1 needs to be modified. *The “intermediate” should include all of the material from the top of the FAS to the base of the SAS. The intermediate aquifer system is a secondary component of the “intermediate” and should be restricted to the mapped aquifers within the “intermediate.”* Most of us in Florida, believe that the naming and mapping of confining units are important for several reasons, e.g. water production, aquifer vulnerability, and sinkhole development. Nevertheless, if we adopt the ASTM Guidelines, we should refer to the “intermediate” as a regional semi-confining to confining unit in Florida.

It should be noted that at the recent SE GSA Meeting, it was proposed that a series of “intermediate” aquifers in southwest Florida be named the “Hawthorn aquifer system.” Geographically, the proposed “Hawthorn aquifer System” only represents a sub-area within the SWFWMD that contain aquifers within the “intermediate.” Based on the ASTM Guidelines, I believe the mentioned aquifers do represent an intermediate

aquifer system. However, the proposed "Hawthorn" does not map very well on a "one-to-one" relationship with the stratigraphic Hawthorn Group. Because of potential confusion with the two "Hawthorn" terms, I believe another geographical name for the aquifer system should be used.

Consider the term ICU. The ASTM supports terms such as aquifer system, aquifer, and zone (analogous with the stratigraphic terms such as group, formation, and bed). On the other hand, the ASTM article specifically states that although a confining unit can be named, the unit should not be used in a hierarchal sense. From their perspective, there is only one proposed "confining" term and that is the *confining unit*.

The term intermediate aquifer system or intermediate confining unit has been in use for over 20 years. Since it is entrenched we should consider keeping the term. However, because the "intermediate", on a statewide basis, acts more as a confining unit than an aquifer system, *an alternative term is the intermediate confining unit or intermediate aquifer system*.

(4) Definition of aquifer system. The definition that the ASTM article uses for aquifer system is based on the work of Poland et al. (1972). It is,

"A heterogeneous body of intercalated permeable and poorly permeable material that functions regionally as a water-yielding hydraulic unit; it comprises two or more permeable beds (aquifers) separated at least locally by aquitards (confining units) that impede ground-water movement but do not greatly affect the regional hydraulic continuity of the system."

On the other hand, I believe there is another definition that should be considered is taken from the American Geological Institute (Jackson, 1997). It is,

"A heterogeneous body of intercalated permeable and less permeable material that acts as a water-yielding hydraulic unit of regional extent."



Some Ad Hoc Committee members have indicated to me that they believe the Poland et al. definition of an aquifer system requires that aquifers and confining units be situated only in a vertical sequence. The named aquifers within the SAS of Florida grade laterally into unnamed aquifer(s). If the *vertical only* concept is the accepted one, then the surficial aquifer system (SAS) of Florida does not meet the necessary requirements for being an aquifer system. However, the SAS does meet the necessary requirements as being an aquifer system in the Jackson definition.

What should be done in Florida? In Florida, the lithology of the SAS aquifers grade laterally. That is, they go through a facies change. It should also be noted that, other than the vertical issue, the SAS meets definition requirements in both the Poland et al. and the Jackson definitions. The SAS is of regional extent and it is entrenched in the literature. And finally, other states all along the eastern seaboard of the U.S. have equivalents of the SAS. That is, they have surficial aquifer systems that grade laterally in

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lithology. With this in mind, I believe the Ad Hoc Committee should adopt the Jackson definition of aquifer and not change the definition of the SAS.

Regarding the term confining unit, the ASTM article refers to the definition used by Lohman et al. (1972). It is, “a body of impermeable material stratigraphically adjacent to one or more aquifers... It will now supplant the terms aquiclude, aquitard, and aquifuge.”

(5) SAS directly over the FAS (Issue 6). Again the ASTM article states that an aquifer (or aquifer system) should be separated by a confining unit. The confining unit should be mappable. Thus in Figure 2, the sands of *the SAS should be placed back into the FAS*. The closest example in the ASTM article is found in “Example 5” on page 705 and 706 for section C-D. In that example the surficial sands in the cross section are part of the Bass aquifer, which in the figure corresponds to the Bass Sand. I support this interpretation.

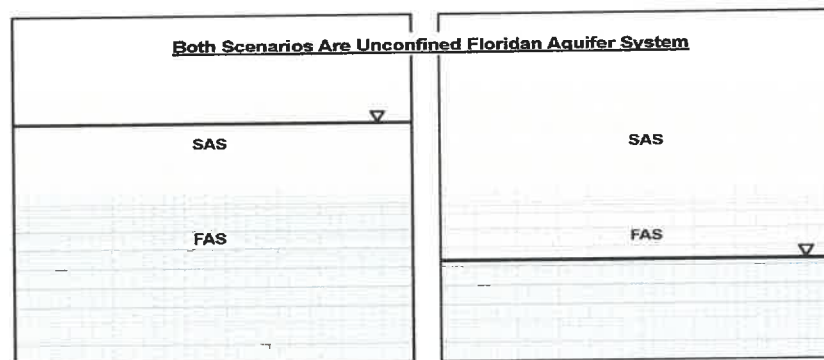


Figure 2.

(6) undifferentiated aquifer systems (Issue 7). If an aquifer system must have a confining unit above and below (unless it is unconfined), then the most recent term, “undifferentiated aquifer systems”, adopted by the ad Hoc Committee representing the hydrostratigraphic material lying below the FAS, needs to be changed. I suggest we should simply tweak the term to the *sub-Floridan confining unit and undifferentiated aquifer systems* and make an effort to explain that the confining unit is not appropriately mapped.

(7) Aquifer naming. Currently, the Ad Hoc Committee recognizes several aquifers and aquifer systems. Below I have listed them and spelled them as informal units. They are the surficial aquifer system, sand and gravel aquifer, Biscayne aquifer, intermediate aquifer system or intermediate confining unit, Floridan aquifer system, Upper Floridan

aquifer, Lower Floridan aquifer, and the Middle (Floridan) confining unit. I have suggested a possible modification of the term “intermediate” to the intermediate confining unit and aquifer system. In addition, I suggest we redefine the undifferentiated aquifer systems to the sub-Floridan confining unit and undifferentiated aquifer systems (see Table 1).

(8) Spelling of the term ground water. The Ad Hoc Committee has determined that the term groundwater will be the official term, regardless of whether or not it is a noun or an adjective. Unfortunately, the ASTM article uses the USGS interpretation; that is ground water for a noun and ground-water for an adjective. For consistency, I believe we should adopt the USGS interpretation and make efforts to make it the standard within the DEP and the WMDs. The effort would go a long way in the effort to adopt a statewide standard.

Table 1. Florida’s Regional Hydrostratigraphic Units
Including possible modifications based on ASTM Criteria

SP 28 (1986)	Ad Hoc Committee’s Proposed Units	Possible Units based on ASTM (2004) Guidelines
surficial aquifer system	Surficial Aquifer System	surficial aquifer system
Biscayne aquifer	Biscayne Aquifer	Biscayne aquifer
sand-and-gravel aquifer	Sand-and-Gravel Aquifer	sand and gravel aquifer
intermediate aquifer system or intermediate confining unit	Intermediate Aquifer System (Intermediate Aquifer System or Intermediate Confining Unit)	(1) intermediate confining unit or intermediate aquifer system or (2) intermediate aquifer system or intermediate confining system
Floridan aquifer system	Floridan Aquifer System	Floridan aquifer system
	Upper Floridan Aquifer	Upper Floridan aquifer
	Middle (Florida) Confining Unit	Middle (Floridan) confining unit
	Lower Floridan Aquifer	Lower Floridan aquifer
Sub-Floridan confining unit	undifferentiated aquifer systems	sub-Floridan confining unit and undifferentiated aquifer systems