SRNL
SAVANNAH RIVER NATIONAL LABORATORY

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To: J. Newman

From: M. Millings M. Millings
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cc: E. Stevens
E. Wilhite
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Summary of the Quality Review Process for General Separations Area Aquifer Model Database

This memo summarizes the data collection and review process employed by SAIC in constructing the database used for the GSA FACT and PORFLOW aquifer models. Smits et al. (1997) describe some of the methods used to compile and evaluate the data. Other information regarding the review process came from verbal communication (per telephone conversation with K. Hawkins, SAIC, and verbal communication with M. K. Harris, SRNL) as well as the documentation files provided by SAIC.

Raw Data

Initial efforts concentrated on collecting and compiling various forms of raw data including SRS coordinates, elevations, geophysical logs, piezocone penetration test (CPT) logs, drill-core descriptions, slug test data, single and multiple well pump test data, and laboratory permeability measurements (Flach and Harris 1997; Smits et al 1997). Much of this data was provided by the drilling or laboratory subcontractors, and thus acquired under their quality assurance procedures.

SAIC gathered coordinate and elevation data, drill core descriptions, and permeability data (i.e., slug test data, single and multiple well pump test data, and laboratory permeability measurements) and input the data into a Paradox version 7.0 relational database. Geophysical logs, CPT logs, and core descriptions were also used to interpret lithologic and hydrogeologic boundaries or picks (see Interpretative Data below), which were also included in this database. Some of these data (e.g., coordinates, elevations, geophysical and CPT logs) are currently available electronically in the SRS Landmark database.

For the permeability dataset, SAIC provided location and elevation information, the type test used, sample and test dates, the source of the data (e.g., report number and author), noteworthy comments, and hydraulic conductivity data. In addition, they included the initials of the SAIC data entry analyst and the SAIC reviewer in the database. An example of the laboratory permeability data extracted from the Paradox database is presented in Attachment A.

Drill core descriptions included in the database and used for interpreting picks consisted of foot-by-foot descriptions of sediments. These descriptions had been performed by subcontractors according to the SRL ESSOP-2-15 (WSRC 1990) procedure and existed both in hard copy (handwritten) and electronically in a Reflex computer database program (per verbal communication with M. K. Harris) (Reflex is an old DOS database system by Borland Software Corporation).

Core descriptions included data on amount of core recovery; degree of induration; color; sedimentary structures; volume percent terrigenous gravel, sand, and mud; maximum and modal size of the terrigenous fraction; volume percent carbonate gravel, sand, and mud; volume percent cement; volume percent total carbonate sediment; sediment/rock name; grain sorting; volume percent porosity and dominant type; fossil types, and volume percent accessory constituents, including muscovite, glauconite, lignite, sulfides, and heavy minerals (WSRC 1990). A summary of the core description format is included as attachment B. A hard copy example of an original handwritten data sheet containing core information is included in attachment C.

SAIC's task also included performing a check of the electronic core description data with the handwritten original data sheets. Each core description was assigned a letter designating the level of quality review that had been performed. "A" indicated that the original core description was checked against the Reflex printouts; "B" was assigned to cores in which an original core description was available, but had not been checked against the Reflex printouts; and "C" meant that no original core descriptions could be found and only an electronic copy (Reflex software) was available. The "QA level" or letter was indicated on SAIC's lithostratigraphic and hydrostratigraphic pick forms (see Interpretative Data below). Currently, the converted core description files are available in Excel format. Attachment D provides an example of an electronic core description record.

Interpretative Data

Geophysical and piezocone penetration test data in addition to core descriptions were used to determine lithostratigraphic and hydrostratigraphic boundaries or picks. Initial interpretations were completed through previous modeling efforts (e.g., Thayer et al. 1993). Smits et al. (1997) reviewed and revised these existing picks (as needed) in addition to providing picks for new or additional locations.

SAIC documented their reviews and any changes made to the picks. Attachment E provides an example of SAIC's review of previous hydrostratigraphic picks completed for BGO52AA. The form documents the person who originally described the core, previous hydrostratigraphic picks made for the location based on core descriptions and geophysical logs, the source of the initial picks (e.g., "WSRC-RP-94-1286 Fig. 11" (WSRC 1995)), any revisions that were made to the picks, and the date of the SAIC review. Attachment F shows an example of hydrostratigraphic picks completed by SAIC for a new location in the database. The example form shows the picks for FIW002MA with the date and initials of the person who made the interpretations. A second review of the data and picks was performed by a different person (as indicated by the initials and date in the box on the form) when the data were entered into the electronic database (per K. Hawkins, telephone conversation).

Similar documentation exists for the lithostratigraphic picks made and reviewed by SAIC. Attachments G through I provide examples of the documentation and the review process for various cores.

Information regarding the types of geophysical logs (e.g., gamma ray, caliper, resistivity), person who performed the core description, field logs and dates, SAIC's quality review level (A, B, or C) and pick information was recorded (if available) for each core. Notes were also made regarding contact types (e.g., unconformity, gradational, conformable), initials and date of person(s) making the picks, date and initials of field checks and any revisions made to the picks. Field checks of the picks involved traveling to the core repository (at the time, the Gunsite Core Inventory), finding the boxes of the core in question and examining the core to verify picks that had been made based on the geophysical logs and written core descriptions.

References

Flach, G. P. and Harris, M. K., 1997, *Integrated Hydrogeological Model of the General Separations Area (U), Volume 2: Groundwater Flow Model (U)*, WSRC-TR-96-0399, Rev. 0, Westinghouse Savannah River Company, Aiken, SC 29808.

Smits, A. D., Harris, M. K., Hawkins, K. L. and Flach, G. P., 1997, *Integrated Hydrogeological Model of the General Separations Area (U), Volume 1: Hydrogeologic Framework (U)*, WSRC-TR-96-0399, Rev. 0, Westinghouse Savannah River Company, Aiken, SC 29808.

Thayer, P. A., Smits, A. D., Harris, M. K., Amidon, M. B. and Lewis, C. L., 1993, *Hydrostratigraphic Maps of the General Separations Area (GSA), Savannah River Site (SRS), Aiken, South Carolina, Phase II (U)*, WSRC-RP-94-40, Westinghouse Savannah River Company, Aiken , SC 29808.

WSRC, 1990, "ESSOP-2-15: Microscopic Examination of Sediment Cores". *Environmental Sciences Operating Procedures*. Manual WSRC-L-14.1, Westinghouse Savannah River Company, Aiken, SC 29808.

WSRC, 1995, *Burial Ground Complex Field Investigation Preliminary Data Report, Volume 1 (Text)*, WSRC-RP-94-1286, Vol. 1, Westinghouse Savannah River Company, Aiken, SC 29808.

Attachment A: Laboratory Permeability Information Extracted from Paradox Database

Site I.D.	Interval Top	Interval Bottom	Test Date	Test Type	Sample Type	K-Vert. (ft/d)	Collection Date	K-Horiz. (ft/d)	Reference ID	Comments	Reviewed By	Date Reviewed	Entry	Entry Date	Sample No.	IOU
BGO003A	162	164	8/4/1994	SHBT	UD	1.14E-05	5/4/1994	2.10E-05	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
BGO003A	266.1	267	5/19/1994	SHBT	UD	1.42E-04	5/6/1994	2.30E-04	AMDNM-1995-001	Data from AT&E Report No. 93265.	ADS	1/1/1996	KLH	1/1/1996		GSA
BGO003C	72	73.5	8/3/1994	SHBT	UD	6.82E-05	5/11/1994	8.80E-03	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
BGO051AA	298	299.75	8/4/1994	SHBT	UD	2.27E-05	5/16/1994	1.11E-05	AMDNM-1995-001	Data from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
BGO051B	85	87.2	8/3/1994	SHBT	UD	1.11E-05	6/2/1994	1.73E-05	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
BGO051B	180	182.5	8/4/1994	SHBT	UD	1.65E-05	6/2/1994	2.27E-05	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
OFS001SB	67	68.65	8/3/1994	SHBT	UD	3.41E-05	6/22/1994	1.70E+00	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
OFS003SB	63	65	8/3/1994	SHBT	UD	6.82E-05	6/1/1994	1.70E-01	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
OFS003SB	135	137	8/3/1994	SHBT	UD	4.83E-06	6/2/1994	7.95E-06	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
OFS004SB	45	47	8/3/1994	SHBT	UD	6.25E-04	6/6/1994	5.40E-03	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
OFS004SB	135	136.5	8/3/1994	SHBT	UD	1.14E-05	6/13/1994	6.53E-05	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
OFS005SB	27	28.9	8/3/1994	SHBT	UD	1.42E+00	6/16/1994	1.42E+00	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
OFS005SB	108.6	109.6	8/3/1994	SHBT	UD	4.54E-06	6/17/1994	1.79E-05	AMDNM-1995-001	Data is from AT&E Report No. 97560.	ADS	1/1/1996	KLH	1/1/1996		GSA
HSB069A	120	120.8				1.52E-04			AT&E-1988-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB117A	111.67	112.34				1.81E-03			AT&E-1988-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB139A	115	115.6				2.20E-04			AT&E-1988-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB101C	82	82.5				2.37E+02			BHANS-unk-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB101C	84.5	85				1.69E+02			BHANS-unk-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB103C	27	27				3.56E+01			BHANS-unk-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB103C	78.4	78.5				1.42E+02			BHANS-unk-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB103C	81.5	81.6				2.53E+02			BHANS-unk-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB103C	83.4	83.5				2.53E+02			BHANS-unk-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB105C	87.4	87.5				1.64E+02			BHANS-unk-001		ADS	1/1/1996	KLH	1/1/1996		GSA
HSB105C	88.5	88.6				8.19E+01			BHANS-unk-001		ADS	1/1/1996	KLH	1/1/1996		GSA

SHBT = shelby tube; UD = undisturbed

AMDNM-1995-001 = WSRC-RP-94-1286, Burial Ground Complex Field Investigation Preliminary Data Report #1, January 1995, M. B. Amidon

AT&E-1988-001 = Report of Laboratory Testing for Savannah River Plant, Job No. 7778-C, Report No. 3473, June 1988, Atlanta Testing & Engineering

BHANS-unk-001 = DP-1762, Geology and Hydrology of the H-Area Seepage Basins, S. J. Bohannon, K. A. Sargent, J. T. Marsh, M. K. Harris, V. Price

Attachment B: SRS Core Logging Format

(the following is extracted from Smits et al. 1997)

NOTE:
This appendix presents an explanation of all data fields in the description code used at SRS. Database field names are indicated with underlined, boldface type. Superheadings (groups of related fields) are indicated in italics with underlined, boldface type. Content is adapted from WSRC ESSOP-2-15, *Binocular Examination of Sediment Core Samples* (Revision 2). Refer to Appendix B- *Lithologic Descriptions* for a listing of specific data fields used in the Earth Vision® dataset.

GENERAL

1). Make letters and numbers clear and unambiguous. Use standard, block, uppercase letters. Use letters and numbers only; no symbols.

2). Left justify letters; Right Justify numbers.

3). Estimating percentages

-If constituent <10% or 90%, use increments of 1%
-If constituent between 10% and 90% use increments of 5%
-Highest value is 99%
-Use .1 for trace quantities (<1%)

4). Core Description

Log core from bottom up. Slice core to observe sedimentary structures. Thin layers or laminae, less than a few inches, should be noted under "Structure".

Certain properties are best determined in hand specimen: color, structure, maximum size, roundness, sorting, etc., are best determined with a binocular microscope.

5). If there is sediment, especially pebbles and sand, in the top few inches of a core that is obviously different from the underlying material, it probably fell down ("caved") from up the hole and should not be described.

6). Put your initials (e.g., LOGGED BY: PAT) and date (DD-MM-YY format) in upper left corner of the log sheet. Fill in the page numbers in upper right corner (e.g., 1 of 8). Check in lower right corner of log sheet whether core is WET or DRY. Log core in sequence and record all page numbers in sequence.

WELL (Cols. 1-8)

Record only on top line of sheet.

Cols 1-3 [**Well Series**] Letter or letters. Left justify (LJ).
Cols. 4-6 [**Well Number**] Number. Right justify (RJ).
Cols. 7-8 [**Screen Zone**] Letter. Left Justify (LJ).

Examples: P_18TA
CMP_09_

DEPTH (Cols. 9-12)

Starting at bottom of core, describe in one-foot increments. Assume that missing core results from failure to sample bottom of interval. Record on computer load sheets from the bottom of the sheet upward.

(Right Justify) (RJ).

Examples: 115
89
7
127

RECOVERY [INDUR] (Col. 14) = Degree of Lithification

1 = Loose	Core unlithified.
2 = Friable	Core coherent, but easily disaggregated.
3 = Hard	Core firm, but grains can be dislodged.
4 = Very Hard	Hard rock (some carbonates, silicified rock, or iron oxides).

COLOR (Cols. 15-19)

Left Justify (LJ).

Use most common or overall color. Prefix main rock color with shade. (i.e., light, medium, or dark).

Colors: Use first two letters of color:

BR = Brown
OR = Orange
PI = Pink
PU = Purple
RE = Red
TA = Tan
WH = White
YE = Yellow

Exceptions:

BE = Blue
BK = Black
GN = Green
GY = Gray
MT = Mottled
VAR = Variegated

STRUCTURE (Cols. 20-27) = Sedimentary Structures

Left Justify.

Leave BLANK for massive, structureless beds.

B = Color banded (B + color; e.g., BGY = banded gray)
BR = Brecciated
BU = Burrow
CLB = Clay balls (Any gravel sized clay)
CTN = Chert Nodule
FE = Iron oxide nodule
FR = Fracture
FS = Fissle
ICA = Interbedded or interlaminated calcarenite
ICL = Interbedded or interlaminated clay (silt + clay)
IMC = Interbedded or interlaminated micrite
IPB = Interbedded or interlaminated pebbles
ISD = Interbedded or interlaminated sand
MCB = Micrite balls or fragments (gravel sized)
MT = Mottled
PE = Pelleted
PY = Pyrite
RT = Root structure (cast or mold)

VN = Mineral vein
WSP = Wispy laminations or bedding
XB = Cross bedded

Examples: IPBCLB = Interbedded pebbles and clay balls
PYVN = Pyrite Vein

SILICATE **[Use only for siliciclastic fraction]** (Cols. 28-38)

PERCENT GRAVEL, SAND, MUD [%GR % SD % MD] (Cols. 28-38)

Normalize estimated percent siliciclastic gravel, sand and mud (silt + clay) to 100 % and record in appropriate column.

Right Justify.

%GR (Cols. 28-29) **= % GRAVEL (>2mm)**
%SD (Cols. 30-31) **= % SAND (2mm - 0.0625mm)**
%MD (Cols. 32-33) **= % MUD (<0.0625mm)**

SIZE (Cols. 34-37)

MX (Cols. 34-35 **= MAXIMUM SIZE**

Left Justify.

Record maximum size of siliciclastic fraction using following abbreviations:

BO = Boulder (> 256mm)
UC = Upper Cobble (128-256mm)
LC = Lower Cobble (64-128mm)
UP = Upper Cobble (16-64mm)
LP = Lower Pebble (4-16mm)
GR = Granule (2-4mm)
VC = Very Coarse Sand (1-2mm)
C = Coarse Sand (0.5-1mm)
M = Medium Sand (0.25-0.5mm)
F = Fine Sand (0.125-0.25)
VF = Very Fine Sand (0.0625-0.125mm)
CL = Silt and Clay (<0.0625mm)

MD (Cols. 36-37) **= MODAL SIZE**

Modal Size = Most Abundant Size Fraction

Left Justify.

May not be applicable to some carbonates (i.e., those that contain little or no siliciclastic material).

Record modal size using following abbreviations:

BO = Boulder (> 256mm)
UC = Upper Cobble (128-256mm)
LC = Lower Cobble (64-128mm)
UP = Upper Cobble (16-64mm)
LP = Lower Pebble (4-16mm)
GR = Granule (2-4mm)
VC = Very Coarse Sand (1-2mm)
C = Coarse Sand (0.5-1mm)
M = Medium Sand (0.25-0.5mm)
F = Fine Sand (0.125-0.25)
VF = Very Fine Sand (0.0625-0.125mm)
CL = Silt and Clay (<0.0625mm)

ROUNDNESS [RND] (Col. 38)

Record Average Roundness of Quartz grains only, using following scale:

1 = Very Angular
2 = Angular
3 = Subangular
4 = Subrounded
6 = Rounded
9 = Well Rounded

CARBONATE LITHOLOGY **[Use only for carbonate fraction]** (Cols. 39-48)

PERCENT (CARBONATE) **GRAVEL, SAND, MUD [%GR, %SD, %MD]** (Cols. 39-44)

Normalize estimated percent carbonate gravel, sand, and mud to 100%, and record in appropriate column.

Right Justify.

%GR (Cols. 39-40) **= % CARBONATE GRAVEL (>2mm)**
%SD (Cols. 41-42) **= % CARBONATE SAND (>2mm-0.0625mm)**
%MD (Cols. 43-44) **= % CARBONATE MUD (>0.0625mm)**

PERCENT CEMENT [%CMT] (Cols. 45-46)

Record total percent carbonate plus other cement (silica, iron sulfides, iron oxides, phosphate, glauconite, etc.).

Right Justify.

PERCENT CARBONATE [%CAR] (Cols. 47-48)

Check any suspicious sample with 10% hydrochloric acid, and estimate total percent carbonate.

Record total percent carbonate (Sum of matrix, cement, fossils, and other carbonate grains), with-out normalizing to 100%.

Right Justify.

ROCK NAME [%NAME] (Cols. 49-56)

Left Justify.

I. No Carbonate Present (<1% Carbonate)

A. If one size fraction 75% or greater, use following:

PB = Pebbles
SD = Sand
ST = Silt
CL = Clay

B. If another fraction is 25% or greater, use as a modifier with most abundant fraction last.

Example: SDCL = Sandy Clay

C. If **two or more** components are 25% or greater, list the **most abundant fraction last.**

Example: PBSDCL =Pebbly, Sandy Clay

Note: In most clastic sediments it is difficult to distinguish silt from clay. Generally, use CL (clay) for mixtures of clay and silt. Use ST (silt) only for silt or siltstone that is highly porous.

II. Carbonate Present (<1% Carbonate)

A. If Carbonate 75% or greater:

BL = Biomoldic Limestone (numerous megafossil molds)
CA = Calcarenite (granular, sand-sized carbonate)
GM = Green Micrite (looks like green clay)
MC = Micrite (lime mud; chalk)
SL = Shell Limestone (shells &/or shell fragments)
VL = Vuggy Limestone (numerous vugs)
XL = Crystalline Limestone (hard, massive)

B. If Carbonate 50-75%:

Prefix carbonate rock name with other constituent(s), least abundant first.

Examples: SDSL = Sandy, shell limestone
GLSDMC = Glauconitic, sandy micrite

C. If Carbonate 1-50%:

Prefix main rock name with carbonate modifier.

Examples: CM = Carbonated cemented
CMSD = Carbonate-cemented siliciclastic sand
MCCL = Micritic clay (clay is silicate)
SLSD = Shelly, siliciclastic sand

III. Other Lithologic Types

Must be 25% or greater in siliciclastic to be used as a modifier.

Use the following abbreviations:

AR = Arkosic (feldspathic)
CT = Chert cement or emplacement (Use for any silica)
FE = Iron oxides (cement or replacement)
GL = Glauconite (green grains or cement)

LG = Lignite (soft, brown to black, woody fragments)
MU = Muscovite
PH = Phosphate (brown to black shell, bone, or tooth)
PY = Iron sulphides (pyrite or marcasite)

Examples:

PHMC	= phosphatic micrite
CTSLMC	= shelly micrite with chert

SORTING [SORT] (Col. 57)

Record overall sorting of rock using following scale:

W (Well sorted)	If 90% within 2 size classes
M (Moderately sorted)	If 90% within 4 size classes
P (Poorly sorted)	If 90% > 4 size classes
V (Very poorly sorted)	If 90% > 6 size classes

If a sand contains >25% CL (silt + clay) or MC, use P or V.

PERCENT POROSITY [%POR] (COL. 58-59)

Use for all lithologies. Left Justify (LJ).

Estimate percent of large pores by looking at whole core; estimate percent of small pores (2mm) using binocular microscope. Total porosity is sum of large and small pores.

Use following scale:

P (Poor)	= <5% porosity
M (Moderate)	= 5-15% porosity
G (Good)	= 15-30% porosity
E (Excellent)	= >30% porosity

PORE TYPE [PORE TYPE] (Cols. 60-61)

Use for all lithologies.

Record most abundant pore type in Cols. 60-61 using the following abbreviations:

BP = Between Particle (Interparticle) Pore
CH = Channel Pore
MI = Micropore
MO= Moldic Pore

VU= Vug Pore
WP= Within Particle (Intraparticle) Pore

PERCENT MUSCOVITE [%MUSC] (Cols. 62-63)

Record estimated volume percent muscovite.

Right Justify.

PERCENT GLAUCONITE [%GLAU] (Cols. 64-65)

Record estimated volume percent glauconite (As grains, matrix, or cement).

Right Justify.

PERCENT LIGNITE [%LIGN] (Cols. 66-67)

Record estimated volume percent lignite (As dark, soft, woody, peaty or coaly material).

Right Justify.

PERCENT SULPHIDES [%SULP] (Cols. 68-69)

Record estimated volume percent marcasite or pyrite.

Right Justify.

HEAVY MINERALS [HEAV] (Col. 70)

Record estimated volume percent heavy minerals (opaque and non-opaque) using the following scale:

R (Rare) = Very few heavy mineral grains
C (Common) = Heavy mineral grains easy to find
A (Abundant) = "Loaded" with heavy mineral grains

FOSSILS (Cols. 71-80)

List most abundant first. Do not skip spaces between abbreviations.

If fossils are present, but you can't identify, note YE for YES.

If silicified, note CT first, then type(s).

Left justify.

Use the following abbreviations:

BA = Barnacle
BR = Bryozoan
ES = Echinoid Spine
FO = Foraminifer
GA = Gastropod
GI = *Crassostrea gigantissima*
OS = Ostracode
PL = Pelecypod
SA = Eichinoderm (Sand Dollar)
SP = Sponge Spicule

Examples: CTPLGA = Silicified pelecypods & gastropods
BRFO = Bryozoans and foraminifiers

Examples: VARRE = Variegated Red (red dominant color)
MTGN = Mottled Green (green dominant color)
GYGN = Grayish Green (green dominant color)

Shades - Use first letter of shade:

L = Light
M = Medium
D = Dark

Examples: DPUYE = Dark purplish yellow
LREBR = Light reddish brown

STRUCTURE (Cols. 20-27) = Sedimentary Structures

Left Justify.

Leave BLANK for massive, structureless beds.

B = Color banded (B + color; e.g., BGY = banded gray)
BR = Brecciated
BU = Burrow
CLB = Clay balls (Any gravel sized clay)
CTN = Chert Nodule
FE = Iron oxide nodule
FR = Fracture
FS = Fissle
ICA = Interbedded or interlaminated calcarenite
ICL = Interbedded or interlaminated clay (silt + clay)
IMC = Interbedded or interlaminated micrite
IPB = Interbedded or interlaminated pebbles
ISD = Interbedded or interlaminated sand
MCB = Micrite balls or fragments (gravel sized)
MT = Mottled
PE = Pelleted
PY = Pyrite
RT = Root structure (cast or mold)
VN = Mineral vein
WSP = Wispy laminations or bedding
XB = Cross bedded

Examples: IPBCLB = Interbedded pebbles and clay balls
PYVN = Pyrite Vein

Attachment C: Example of Original Core Description Record Sheet for FCH5

(FRONT PAGE)

LOGGED BY: W. Ryder (SAIC) DATE: 11/1/92

SRS CORE LOG SHEET

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WELL LJ	WELL RJ	WELL LJ	DEPTH	RECOV	INDUR	COLOR	STRUCTURE	SILICATE =100% %GR	SILICATE =100% %SD	SILICATE =100% %MD	SILICATE SIZE MX	SILICATE SIZE MD	RND	CARBONATE =100% %GR	CARBONATE =100% %SD	CARBONATE =100% %MD	%CMT	%CAR	NAME	SORT	%POR	PORE TYPE	%MUSC	%GLAU	%LIGN	%SULP	HEAV	FOSSILS
F.C.H	0.0.5			0																							
			77		1	M,R,E,0,R		.1	96	FI	6R	M	3					0	S,D	M	M	B,P	0	0	0	0	C	
			78	7	1	M,R,E,0,R		.1	96	5	6R	M	3					0	S,D	M	M	B,P	.1	C	0	0	C	
			79		1	M,R,E,0,R		.1	97	3	6R	M	2					0	S,D	M	M	B,P	0	0	0	0	C	
			80		1	M,R,E,0,R		0	97	3	VC	M	3					0	S,D	P	M	B,P	0	0	0	0	C	
			81		1	D,V,E,0,R		.1	97	3	6R	C	3					0	S,D	M	E	B,P	.1	0	0	0	C	
			82		1	D,V,E,0,R		.1	97	3	6R	C	3					0	S,D	M	E	B,P	.1	0	0	0	C	
			83	6	1	D,V,E,0,R		.1	96	5	6R	C	3					0	S,D	M	E	B,P	.1	0	0	0	C	
			84	0																							
			85	0																							
			86	0																							
			87	7	1	D,V,E,0,R		.1	94	6	6R	C	4					0	S,D	M	E	B,P	.1	0	0	0	C	
			88	0																							
*			89		1	D,V,E,0,R		.1	96	4	6R	C	3					0	S,D	M	E	B,P	0	0	0	0	C	
			90		2	M,V,E,0,R		0	2	98	M	C,L	4					0	C,L	V	P	M,F	.1	0	0	0	C	
*			91	0																							
*			92	0																							
*			93	0																							
*			94		2	D,V,E,0,R		.1	79	20	L,P	F	3					0	S,D	P	P	B,P	.1	0	0	0	C	
*			95		2	D,V,E,0,R		.1	84	15	L,P	F	3					0	S,D	P	P	B,P	.1	0	0	0	C	
*			96		2	D,V,E,0,R		.1	94	6	6R	M	3					0	S,D	M	G	B,P	.1	0	0	0	C	
*			97		2	D,V,E,0,R		.1	95	5	6R	M	3					0	S,D	M	G	B,P	.1	0	0	0	C	
*			98		2	D,V,E,0,R		0	96	4	VC	M	4					0	S,D	M	G	B,P	.1	0	0	0	C	
*			99		2	M,V,E,0,R		0	85	15	VC	M	3					0	S,D	M	M	B,P	.1	0	0	0	C	
F.C.H	0.0.5		100		2	M,V,E,0,R		.1	85	15	6R	M	3					0	S,D	P	M	B,P	.1	0	0	0	C	

CORE: WET ☒ DRY ☐

(BACK PAGE)

PAGE 4 OF 11
FCHS

*89 SHARR CONTACT OVERLYING LITHO. STARTS AT 88.9

*91 } 36" SHELBY TUBE
*92
*93

*94 SPECKS OF MNO STAINS (BK)
*95 " " " " "
*96 " " " " "
*97 " " " " "
*98 " " " " "
*99 " " " " "

Attachment D: Example of Description for FCH5 from Electronic Database

site id	easting	northing	grnd surface msl	depth	recovery	induration	color	structure	%sil gr	%sil sand	%sil mud	max size	modal size	roundness	%carb gr	%carb sand	%carb mud	% cement	Total %carb	name	sorting	% porosity	pore type	% musc	% glauconite	% lignite	% sulfide	heavy mins	fossils	interpretation qualifier	interpreted by	date interpreted
FCH005	51667.65	76992.12	284.2	50	9	1	DYEOR		0	90	10	VC	F	3					0	SD	M	M	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	51		1	VARRE		0	93	7	VC	F	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	52		1	VARRE		0	93	7	VC	F	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	53		1	VARPU		0	94	6	VC	F	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	54		1	VARPU		0	94	6	VC	F	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	55		1	VARPU		0	93	7	VC	F	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	56		1	DYEOR	MTMGYPU	0.1	90	10	GR	M	3					0	SD	M	M	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	57		1	MGYPU	MTMRBR	0.1	92	8	GR	C	3					0	SD	M	G	BP	0.1	0	0	0	R				
FCH005	51667.65	76992.12	284.2	58		1	DYEOR	MTMRBR	1	92	7	GR	C	3					0	SD	M	G	BP	0.1	0	0	0	R				
FCH005	51667.65	76992.12	284.2	59		1	DREBR		1	92	7	GR	C	3					0	SD	M	G	BP	0.1	0	0	0	R				
FCH005	51667.65	76992.12	284.2	60	7	1	DREBR		1	94	5	GR	C	3					0	SD	M	G	BP	0.1	0	0	0	R				
FCH005	51667.65	76992.12	284.2	61		1	MYEBR		2	97	3	GR	C	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	62		1	DREBR		0	92	8	VC	F	3					0	SD	P	M	BP	0	0	0	0	R				
FCH005	51667.65	76992.12	284.2	63		1	DREBR		0	90	10	VC	F	3					0	SD	P	M	BP	0	0	0	0	R				
FCH005	51667.65	76992.12	284.2	64	9	1	DREBR		0	90	10	VC	F	3					0	SD	P	M	BP	0	0	0	0	R				
FCH005	51667.65	76992.12	284.2	65	0				0	88	12				0	0	0	0	0	SD										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	66		1	MYEBR	BDREBR	0.1	90	10	GR	M	3					0	SD	P	M	BP	0	0	0	0	R				
FCH005	51667.65	76992.12	284.2	67		1	DREBR	BDYEOR	1	89	10	GR	M	3					0	SD	P	M	BP	0	0	0	0	R				
FCH005	51667.65	76992.12	284.2	68		1	DREBR	MTMYEBR	1	89	10	GR	M	3					0	SD	P	M	BP	0	0	0	0	R				
FCH005	51667.65	76992.12	284.2	69		1	DREBR	MTMYEBR	0	92	8	VC	M	3					0	SD	M	G	BP	0	0	0	0	R				
FCH005	51667.65	76992.12	284.2	70		1	DREBR	MTMYEBR	0.1	92	8	GR	M	3					0	SD	M	G	BP	0	0	0	0	R				
FCH005	51667.65	76992.12	284.2	71		1	DREBR		0.1	94	6	GR	M	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	72		1	DREBR		0.1	94	6	GR	M	3					0	SD	P	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	73		1	DREBR		0.1	94	6	GR	M	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	74		1	DYEOR		0.1	97	3	GR	M	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	75	6	1	DYEOR		0	96	4	VC	M	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	76	0				0	88	12				0	0	0	0	0	SD										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	77		1	MREOR		0.1	96	4	GR	M	3					0	SD	M	M	BP	0	0	0	0	C				
FCH005	51667.65	76992.12	284.2	78	7	1	MREOR		0.1	95	5	GR	M	3					0	SD	W	M	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	79		1	MREOR		0.1	97	3	GR	M	2					0	SD	M	M	BP	0	0	0	0	C				
FCH005	51667.65	76992.12	284.2	80		1	MREOR		0	97	3	VC	M	3					0	SD	P	M	BP	0	0	0	0	C				
FCH005	51667.65	76992.12	284.2	81		1	DYEOR		0.1	97	3	GR	C	3					0	SD	M	E	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	82		1	DYEOR		0.1	97	3	GR	C	3					0	SD	M	E	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	83	6	1	DYEOR		0.1	95	5	GR	C	3					0	SD	M	E	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	84	0				0	88	12				0	0	0	0	0	SD										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	85	0				0	88	12				0	0	0	0	0	SD										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	86	0				0	88	12				0	0	0	0	0	SD										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	87	7	1	DYEOR		0.1	94	6	GR	C	4					0	SD	M	E	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	88		1	DYEOR		0.1	96	4	GR	C	3					0	SD	M	E	BP	0	0	0	0	C				
FCH005	51667.65	76992.12	284.2	89		2	MYEOR		0	2	98	M	CL	4					0	CL	V	P	MI	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	90	0				0	12	88				0	0	0	0	0	CL										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	91	0				0	12	88				0	0	0	0	0	CL										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	92	0				0	12	88				0	0	0	0	0	CL										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	93	0				0	12	88				0	0	0	0	0	CL										iu	SAIC/u	1994
FCH005	51667.65	76992.12	284.2	94		2	DYEOR		1	79	20	LP	F	3					0	SD	P	P	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	95		2	DYEOR		1	84	15	LP	F	3					0	SD	P	P	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	96		2	DYEOR		0.1	94	6	GR	M	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	97		2	DYEOR		0.1	95	5	GR	M	3					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	98		2	DYEOR		0	96	4	VC	M	4					0	SD	M	G	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	99		2	MYEOR		0	85	15	VC	M	3					0	SD	M	M	BP	0.1	0	0	0	C				
FCH005	51667.65	76992.12	284.2	100		2	MYEOR		0.1	85	15	GR	M	3					0	SD	P	M	BP	0.1	0	0	0	C				

Attachment E: Example Documentation of SAIC's Review of Existing Hydrostratigraphic Picks

Site I.D.: B60-52AA
(Series-No.-Scr.)

Geo. Log: _____ GR | Cal | Res

Core Desc.: W. Parker QA Level: A

Field Log: _____ Date: _____

UNIT	Depth to Top (ft. bgl) Core	Depth to Top (ft. bgl) Geophy. Log	Picked By:	Date (dd-mmm-yy)
TCCZ	75 ✓	75 ✓	WSRC-RP-94-1286 (Fig. 11)	1995
LAZ	85 ✓	85 ✓	WSRC-RP-94-1286 (Fig. 11)	1995
GCU	157① 163	157① 163	WSRC-RP-94-1286 (Fig. 11)	1995
GAU	166① 171	166① 171	WSRC-RP-94-1286 (Fig. 11)	1995
MBCS	272① 270	272① 270	WSRC-RP-94-1286 (Fig. 11)	1995

Comments:

① Revision 6/28/96 ADS

✓ Reviewed 6/28/96 ADS

Attachment F: Example Documentation of Hydrostratigraphic Picks Completed by SAIC

Science Applications International Corporation

Contract: C001015P
Delivery Order: 19
Project Title: General Separations Area Hydrogeological Report

Accession No.:

Site I.D.: FIW 002 MA

Database Entry Record for

HYDROSTRATIGRAPHIC BOUNDARIES

SYSTEM	Unit	zone	Depth to Top: Core Log	Depth to Top: Geophysical Log	Flag	Picked By: Initials	Picked By: Date	Remarks
FLORIDAN AQUIFER SYSTEM	Upper Three Runs Aquifer	"upper" aquifer zone*	NA	NA		ADS	7/31/96	
		"tan clay" conf. zone	102	102				
		"lower" aquifer zone	~~110~~ 111	111				
	Gordon Confining Unit		170	170				
	Gordon Aquifer		174	174				
MEYERS BRANCH CONFINING SYSTEM			NP	NP		ADS	7/31/96	

* Defined as top of Water Table; reference listed in Remarks, if applicable

Flagging Codes

NP = unit not penetrated
NA = data not avail.

Data Entry Completed	
Initials:	KLH
Date:	8/2/96

hydrotop.xls, Rev. 0, 7/26/96

Attachment G: Example Documentation of SAIC's Lithostratigraphic Picks and Review for FIW-1MC

Site I.D.: FIW-1MC
(Series-No.-Scr.)

Geop. Log:	Woodward Clyde	GR	Cal	Res
		✓	✓	1,16

SP 3/19/92

Core Desc. W. Parker, 3-Jun92 QA Level: 4

Field Log: SEC-Donohue Date: 3/18/92
M.D. Hill

UNIT	Sub-Unit	Depth to Top (ft. bgl)		Contact Type	Picked By:	Date (dd mmm-yy)	
"upland"	-	Core G. log					
Barnwell		17	17	u	ADS	6/15/96	*
	Tobacco Rd.						
	Dry Br.						
Santee		140	140	u	ADS	6/15/96	*
	Santee						
	Warley Hill						
Congaree		NP	NP	-	ADS	6/15/96	
Ellenton	-	NP	NP	-	ADS	6/15/96	

Contact Types

U	unconformity
G	gradational
C	conformable
i	inferred, missing interval

✓

Attachment H: Example Documentation of SAIC's Lithostratigraphic Picks and Review for YSC-5A

Site I.D.: YSC-5A
(Series-No.-Scr.)

Geop. Log:	✓	GR ✓	Cal	Res ✓

Core Desc. Yes SBH QA Level: 3B SBH = Steven B Harper

Field Log: NA Date: —

UNIT	Sub-Unit	Depth to Top (ft. bgl)	Contact Type	Picked By:	Date (dd-mmm-yy)
"upland"	-	Core / G-log ② 27 ② 28'		MKH/ADS	5/10/96
Barnwell		30 / 30?	c①	Harris/Smits	19 Apr 96 *
	~~Tobacco Rd.~~				
	Dry Br.				
Santee		98/98	C	Harris/Smits	19 Apr 96
	~~Santee~~				
	Warley Hill				
Congaree		145/145	i	Harris/Smits	19 Apr 96
Ellenton	-	np		Harris/Smits	19 Apr 96

Contact Types

U	unconformity
G	gradational
C	conformable, no
i	inferred, missing interval

* Should be field-checked to verify pick.
field-checked 5/10/96
np - not penetrated

① No obvious contact in core description to confirm top of Barnwell Gp.

② ADS 6/11/96

Attachment I: Example Documentation of SAIC's Lithostratigraphic Picks and Review for ZBG-2

Site I.D.: ZBG-2
(Series-No.-Scr.)

Geop. Log: Woodward Clyde | GR ✓ | Cal ✓ | Res 16,64 | SP, 4/22/87, TD@ 76' bgl

Core Desc. unk, no date QA Level: C ~~TD@ 76' bgl~~ ADS TD@ 75'

Field Log: Dames + Moore A.M. Pelletier Date: 4/20/87 TD@ 75' bgl

UNIT	Sub-Unit	Depth to Top (ft. bgl) Core	Depth to Top (ft. bgl) G. log	Contact Type	Picked By:	Date (dd mmm-yy)
"upland"	-					
Barnwell		10	9	U	~~ADS~~	6/15/96
	Tobacco Rd.					
	Dry Br.					
Santee		NP	NP	-	~~ADS~~	6/15/96
	Santee					
	Warley Hill					
Congaree		NP	NP	-	~~ADS~~	6/15/96
Ellenton	-	NP	NP	-	~~ADS~~	6/15/96

Contact Types	
U	unconformity
G	gradational
C	conformable
i	inferred, missing interval

* ~~As-built~~ in file

✓