

SAC



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Salt Repository Project Office
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May 2, 1986

86 MAY -5 P3:29

SWEC COMPUTER CONTROL CENTER

Mr. John J. Linehan, Section Leader
Salt Section
Repository Projects Branch
Division of Waste Management, MS 623-SS
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Linehan:

SUBJECT: TRANSMITTAL OF INFORMATION ON SWEC COMPUTER DATA BASES:
PERMIAN BASIN

The purpose of this letter is to transmit the subject information per your request at the November, 1985 meeting on the Structure and Tectonics of the Palo Duro Basin. This responds to item 3 of the Agreements/Open Items Section of the meeting minutes.

If you have any questions concerning this matter, contact Mr. A. Avel at FTS 976-5916.

Sincerely,

J.O. Neff
Program Manager
Salt Repository Project Office

SRPO:APA:max:1591C

WM Record File 106 WM Project 10
Docket No. _____
PDR
LPDR (S)

Distribution:
Linehan
R. Johnson
(Return to WM, 623-SS)

8605280314 860502
PDR WASTE
WM-16 PDR

1330

John J. Linehan

- 2 -

Enclosures:

- 1) Letter from E.M. Washer (SWEC) to C. Kuntz (ONWI) re: SWEC Computer Data Bases, 12/05/85
- 2) Topical Report: Bruno, T.L., and Heitkamp, A.E., June 1985; Geologic Database Management and Computer Mapping; ONWI/SUB/85/E512-05000-T-38

cc: A. Avel, SRPO
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T. Baillieu1, SRPO
T. Verma, NRC/Col.s., w/encl.
R. Johnson, NRC, w/encl.
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Mr. C. Kuntz
Office of Nuclear Waste Isolation
Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201

December 5, 1985
J.O. No. 13697
OPBST-1697

SWEC COMPUTER DATA BASES
PERMIAN BASIN - GEOLOGIC PROJECT MANAGER

Last week you requested information on the SWEC computer data bases for Geology (well log data) and Rock Mechanics (Lab Test Data). Attached is a brief description of each data base and some examples of the alternate presentations possible.

I also refer you to the SWEC report Geologic Database Management and Computer Mapping, June 1985, by T. Bruno and A. Heitkamp, a copy of which is enclosed. If you have questions or require further information, please call Tim Bruno (617) 589-2206 or Dave Corkum (617) 589-6685.



Everett M. Washer
Project Manager

Attachment

ATTACHMENT 1

GEOLOGIC DATABASE

The database was designed to support geologists who interpret oil and gas well logs. There are two basic types of output from the database. The first, and most common type we produce, is used as input to the computer mapping programs. These output files consist of x-y-z triplets for the well log picks for a specific horizon. The format and content of these files are restricted by the requirements of the mapping programs.

The other type of output is a hardcopy listing of the file that we print periodically (usually monthly) (Table 1). This is a listing of the location, reference elevation, and formation interpretations for every well and every formation in the database. The report is listed by state, county, well number, and formation number. The formation number is an arbitrarily assigned number internal to the database. The numbers were chosen so that older formations have higher numbers. Both the formation numbers and names appear on the listing.

Other types of reports are possible, but are not commonly prepared. For example, we could list all of the operators who have drilled wells deeper than 6000 feet in Oldham County (Table 2). We can also prepare reports sorted on any of the fields in the file, such as a report of the operators who have drilled wells in Deaf Smith County sorted by lease and total depth (Table 3).

Except for geologic information, the file is not complete at this time. Because we have concentrated on entering and verifying geologic data, the Operator, Lease, Formation at bottom, Date Drilled, Total Depth, and associated information has not yet been entered for all wells in the file. We plan to continue to add this information during FY1986.

TABLE 1
 GEOLOGIC WELL FILE
 UPDATED 8/27/85
 ROO COUNTY, NM

WELL	ELEV	LONGITUD	LATITUDE	N	FORM NAME	FTOP	FST	FBOT	Q	SALT
----	----	-----	-----	-	-----	----	---	-----	-	-----
123	4072	-103.18560	33.84640	460	WICHITA	7485		7713		0
				470	WOLFCAMP			8295		0
				500	PENNSYLVANIAN	8295		8645		0
				511	WCL	7713		8295		0
				592	LSON	8295		8645		0
				593	PLSH	8645	A	8645		0
				594	LSSH	8645	A	8645		0
				600	MISSISSIPPIAN	8645	A	8645		0
				603	KINDERHOOK	8645	A	8645		0
				605	WOODFORD	8645	A	8645		0
				610	FUSSELMAN	8645	A	8645		0
				615	MONTOYA	8645	A	8645		0
				700	ELLENBURGER	8645	A	8645		0
				800	CAMBRIAN	8645	A	8645		0
				800	PRECAMBRIAN	8645		99999	T	0
124	4033	-103.11850	33.82450	0	SURFACE	0	S	1		0
				1	OGALLALA	0	S	248		0
				25	TRINITY	248		400		0
				55	CHINLE	400		1843		0
				60	DOCKUM	400		2142		0
				75	SANTA ROSA	1843		2142		0
				100	DEWEY LAKE	2142		2210		0
				110	ALIBATES	2210		2229		0
				120	SALADO	2229		2595		0
				130	YATES	2595		2705		0
				140	UPPER 7 RIVERS	2705		3042		0
				150	LOWER 7 RIVERS	3042		3294		0
				160	QUEEN/GRAYBURG	3294		3784		0
				170	UPPER SAN ANDRES	3784		4408		0
				200	LOWER SAN ANDRES	4408		5016		0
				310	LOWER SAN ANDRES 5	4408		4580		0
				330	LOWER SAN ANDRES 4	4580		4742		0
				350	LOWER SAN ANDRES 3	4742		4870		0
				370	LOWER SAN ANDRES 2	4870		4957		0
				390	LOWER SAN ANDRES 1	4957		5016		0
				410	GLORIETA	5016		5870		0
				420	UPPER CLEAR FORK	5870		6380		0
				430	TURB	6380		6678		0
				440	LOWER CLEAR FORK	6678		7070		0
				450	RED CAVE	7070		7623		0
				451	MATADOR	7070		7623		0
				460	WICHITA	7623		7881		0
				470	WOLFCAMP	7881		8462		0
				500	PENNSYLVANIAN	8462		9123		0
				511	WCL	7881		8462		0

TABLE 2.
GEOLOGIC WELL FILE UPDATE 11/21/85
EXAMPLE OF PRINT OUT

COUNTYNAME	#	OPERATOR	LEASE	TOTAL DEPTH	DEEPEST FORMATION
OLDHAM	6.	SUPERIOR OIL CO.	HATADOR LAND&CATTLE#6	6529	PENNSYLVAN
OLDHAM	7.	SHELL OIL CO.	BIVINS #1-B	11340	PRECAMBRIA
OLDHAM	8.	SHELL OIL CO.	TASCOSA #1	9789	PENNSYLVAN
OLDHAM	10.	SHELL OIL CO.	BIVINS RANCH #1	12950	PRECAMBRIA
OLDHAM	16.	SHELL OIL CO.	L.S.RANCH"B" #1	9200	PRECAMBRIA
OLDHAM	17.	CIG EXPLORATION, INC.	HARE #1	9090	PRECAMBRIA
OLDHAM	18.	SHELL OIL CO.	L.S.RANCH#1	9050	PRECAMBRIA
OLDHAM	19.	CITIES SERVICE CO.	L.S.RANCH#1	9500	PRECAMBRIA
OLDHAM	20.	SHELL OIL CO.	ALAMOSA RANCH#1-60	3502	
OLDHAM	21.	SHELL OIL CO.	ALAMOSA RANCH C #1	9692	PRECAMBRIA
OLDHAM	22.	SHELL OIL CO.	FULTON RANCH#1A-09	7950	PRECAMBRIA
OLDHAM	24.	SHELL OIL CO.	FULTON RANCH#1-51	6030	PRECAMBRIA
OLDHAM	30.	SUPERIOR OIL CO.	HATADOR LAND&CATTLE#2	6104	PRECAMBRIA
OLDHAM	31.	SUPERIOR OIL CO.	HATADOR L&C #1-312	6963	PRECAMBRIA
OLDHAM	32.	STANOLIND OIL & GAS C	M.H.GREEN#1	6106	PRECAMBRIA
OLDHAM	34.	SHELL OIL CO.	ALAMOSA RANCH"A" #3	6549	PRECAMBRIA
OLDHAM	35.	MUNT OIL CO.	ALAMOSA RANCH#1	6191	PENNSYLVAN
OLDHAM	36.	BAKER&TAYLOR DRILL	MANSFIELD A #1	6722	PRECAMBRIA
OLDHAM	37.	SHELL OIL CO.	ALAMOSA RANCH"A" #2	7011	PRECAMBRIA
OLDHAM	38.	SHELL OIL CO.	ALAMOSA RANCH#6-50	6760	PRECAMBRIA
OLDHAM	39.	SHELL OIL CO.	ALAMOSA RANCH#1-50	8799	PRECAMBRIA
OLDHAM	40.	BAKER & TAYLOR	MHO'S MISTAKE#1	7370	PRECAMBRIA
OLDHAM	41.	SHELL OIL CO.	ALAMOSA RANCH"B" #3	7866	PRECAMBRIA
OLDHAM	42.	SHELL OIL CO.	ALAMOSA RANCH"B" #1	7657	PRECAMBRIA
OLDHAM	43.	SHELL OIL CO.	ALAMOSA RANCH"B" #2	7736	PRECAMBRIA
OLDHAM	44.	SHELL OIL CO.	ALAMOSA 315#8	7362	PRECAMBRIA
OLDHAM	45.	SHELL OIL CO.	ALAMOSA 315#4	7439	PRECAMBRIA
OLDHAM	46.	SHELL OIL CO.	ALAMOSA 315#2	7204	PRECAMBRIA
OLDHAM	47.	SHELL OIL CO.	ALAMOSA 315#7	7500	PRECAMBRIA
OLDHAM	48.	SHELL OIL CO.	ALAMOSA 315#1	7200	PRECAMBRIA
OLDHAM	49.	SHELL OIL CO.	ALAMOSA 315#9	7767	PRECAMBRIA
OLDHAM	51.	SHELL OIL CO.	STRAT.TEST#3-50	7757	PRECAMBRIA
OLDHAM	54.	SHELL OIL CO.	STRAT.TEST#5-50	7521	PRECAMBRIA
OLDHAM	55.	SUPERIOR OIL CO.	RALPH GRAY#59-9	7216	PRECAMBRIA
OLDHAM	56.	HUMBLE OIL&REFINING C	JESSIE F.BINFORD#1	6931	PENNSYLVAN
OLDHAM	58.	BAKER&TAYLOR DRILL	JAY TAYLOR C #1	7070	PRECAMBRIA
OLDHAM	59.	SHELL OIL CO.	SHELL BRAVO#1	6921	PRECAMBRIA
OLDHAM	60.	HUMBLE OIL&REFINING C	INOGENE H.TAYLOR#1	7017	PRECAMBRIA
OLDHAM	61.	ATAPCO	J.TAYLOR#1	7572	PRECAMBRIA
OLDHAM	62.	SHELLY OIL CO.	JAY TAYLOR#1	7109	PRECAMBRIA
OLDHAM	63.	ROYAL RESOURCES CORP.	TON GREEN#1	7471	PENNSYLVAN
OLDHAM	64.	RAY A.ALBAUGH	HATADOR LAND&CATTLE#3	6500	PENNSYLVAN
OLDHAM	65.	SUPERIOR OIL CO.	HATADOR LAND&CATTLE#1	6890	PRECAMBRIA
OLDHAM	66.	SUPERIOR OIL CO.	HATADOR LAND&CATTLE#4	7000	PRECAMBRIA
OLDHAM	67.	BARNETT OIL CO.	CURRIE#1	6833	PRECAMBRIA
OLDHAM	68.	GEORGE P.LIVERMORE	HALCOLM MOSER#1	6885	PRECAMBRIA
OLDHAM	69.	PAN AMERICAN PETROLEU	D.WHALEY#1	7645	PRECAMBRIA

TABLE 3.
GEOLOGIC WELL FILE UPDATE 11/21/85
EXAMPLE OF PRINT OUT

COUNTYNAME	##	OPERATOR	LEASE	TOTAL DEPTH	DEEPEST FORMATION
DEAF SHITH	23.	A.L.THOMAS	CAPITOL SYNDICATE #1	500	DOCKUM
DEAF SHITH	20.	AMERICAN PETROFINA CO	EVA BROWN #1	9392	PRECAMBRIA
DEAF SHITH	22.	AMERICAN PETROFINA CO	J.G.MCFARLAND#1	9705	PRECAMBRIA
DEAF SHITH	15.	ASHMUN & HILLIARD	T.VINCENT OPPENHEIM#1	9505	MISSISSIPP
DEAF SHITH	10.	BUTTES RESOURCES CO.	BRORMAN BROTHERS,#1	7511	PENNSYLVAN
DEAF SHITH	27.	D.B.ROBERTSON	BEULA FUQUA #1	275	OGALLALA
DEAF SHITH	17.	DOODLE BUG OIL	H.C.&E.RALL,#1	430	DOCKUM
DEAF SHITH	2.	FRANKFORT OIL CO.	ALLISON&HAYES #1	8375	PRECAMBRIA
DEAF SHITH	1.	FRANKFORT OIL CO.	COFFEY #1	8177	PRECAMBRIA
DEAF SHITH	5.	FRANKFORT OIL CO.	MUSE#1	7983	PRECAMBRIA
DEAF SHITH	6.	FRANKFORT OIL CO.	R.E.GILL#1	8222	PRECAMBRIA
DEAF SHITH	10.	GARDNER BROTHERS DRIL	FRED COLLETT #1	6635	HOLFCAIP
DEAF SHITH	11.	GAS PRODUCING ENTER	J.GARRETT #1	7996	PENNSYLVAN
DEAF SHITH	29.	HEREFORD OIL & GAS	?	710	DOCKUM
DEAF SHITH	35.	HEREFORD SALT,INC.	SHARP #1	1952	QUEEN GRAY
DEAF SHITH	12.	HONOLULU OIL CORP.	H.F. PONDER #1	10187	PRECAMBRIA
DEAF SHITH	39.	HUDSON RESOURCES	TAYLOR #1	8999	PRECAMB
DEAF SHITH	7.	HUMBLE OIL & REFINING	R.J.HYSLOP#1	7805	PRECAMBRIA
DEAF SHITH	8.	HUMBLE OIL & REFINING	V. STANBOUGH #1	6672	HOLFCAIP
DEAF SHITH	9.	HUMBLE OIL&REFINING	REINAUER BROTHERS #1	8073	PRECAMBRIA
DEAF SHITH	24.	K-8 OIL CO.JULIAN ET	HARTMAN #1	522	DOCKUM
DEAF SHITH	16.	KNOX OIL CO.	LANDERGIN #1-RALL	3870	GLORIETA
DEAF SHITH	14.	LANANCE DRILLING CO.	WESTERN REALTY CO.#1	9607	PRECAMBRIA
DEAF SHITH	13.	LEASE & ROYALTY INC.	F.H.LINDSEY #1	8822	PENNSYLVAN
DEAF SHITH	34.	MULLIN OIL CO.	HOODFORD#1	8544	PRECAMBRIA
DEAF SHITH	3.	N.B.HUNT	J.R.OVERSTREET#1	7508	PENNSYLVAN
DEAF SHITH	26.	PENN-TEX	A.E.LLOYD #1	700	DOCKUM
DEAF SHITH	31.	PENN-TEX	PARKER #1	700	DOCKUM
DEAF SHITH	20.	PENN-TEX	R.L. CAMPBELL#1-MUSE	650	DOCKUM
DEAF SHITH	30.	PENZOIL CO.	BLACK #1	8216	PRECAMB
DEAF SHITH	19.	RED HILL PETRO CO.	CHAS.BARRETT COMM	320	OGAL
DEAF SHITH	37.	STONE&HEBSTER ENGR.	DETTEN #2	1275	YATES
DEAF SHITH	33.	STONE&HEBSTER ENGR.CO	DETTEN#1	2843	LSA#3
DEAF SHITH	32.	STONE&HEBSTER ENGR.CO	FRIEHEL#1	2710	LSA#3
DEAF SHITH	36.	STONE&HEBSTER ENGR.CO	JEROME FRIEHEL#1	8282	PENNSYLVAN
DEAF SHITH	25.	TEXACO,INC.	N. T. CARMICHAEL #1	3300	LSA
DEAF SHITH	4.	TEXAS CRUDE OIL CO.	A.C.ROSE#1-78	7011	PENNSYLVAN
DEAF SHITH	30.	VOYAGER PETROLEUM,IN	REINAUER#20-10	9621	PRECAMBRIA
DEAF SHITH	21.	WESTERN UNION OIL	FARNELL #1	4518	U.C. FORK

ATTACHMENT 2

Rock Mechanics Laboratory Test Data Base

The results of rock mechanics laboratory tests on core from program wells performed by SWEC, subcontractors to SWEC and to a lesser extent, subcontractors to ONWI on samples for the Palo Duro Basin have been compiled in a data base called "LABTEST." Data input to the system comes either from tabulations in approved lab test reports, or in cases where an interpretation of the data is required (such as Young's Modulus from the slope of a stress-strain curve), from a checked calculation.

The data base was designed to be accessed and used by SAS, a public domain software system. All of the data derived from a single test specimen is considered a single observation. Each observation is uniquely identified by the variables "well name" and "specimen depth". In addition to the test data, each observation also contains the following information: rock type, formation, corresponding geophysical log depth, testing lab, and remarks, if required. SAS offers the user a wide variety of tabulated or plotted output formats. The data base may be subsetted and sorted to display the data in any convenient form. Several statistical routines are also available to aid in the analysis of the data.

Two examples of SAS output are attached. The first is simply a printout of the mechanical properties tests for a particular rock type from a particular formation (salt, lower San Andres, Unit 4). The second is a printout of the data produced from one of SAS's statistical routines applied to a rock property (variable), in this case P wave velocity, from a given population.

LOWER SAN ANDRES CYCLE 4 - SALTS
MECHANICAL PROPERTIES LABORATORY TESTS
(AMBIENT TEMPERATURE ONLY)
FROM THE PALO DURO BASIN

OBS	WELL	SPECIMEN DEPTH	RXTYPE	TESTING LABORATORY	CONFINING PRESSURE	FRACTURE STRENGTH	STATIC YOUNG'S MODULUS	STATIC POISSON'S RATIO	P-HAVE VELOCITY	S-HAVE VELOCITY	DYNAMIC YOUNG'S MODULUS	DYNAMIC POISSON'S RATIO
1	DET	2664.2	DIRTY SALT	ARA	0.0	2575.0	4.9200	0.31	14300	6250	3.19	0.39
2	DET	2673.1	DIRTY SALT	ARA	2000.0	5253.0	4.1500	0.26	15100	6260	5.10	0.29
3	GFR	2520.3	CLEAN SALT	ARA	0.0	4222.0	2.5700	0.43	14600	7750	4.67	0.30
4	GRB	2527.0	SALT	RSI	0.0	3204.5	2.7550	.	.	.	.	.
5	GRB	2520.0	SALT	RSI	1450.0	6080.5	4.2195	0.32	.	.	.	.
6	GRB	2500.0	SALT	RSI	2175.0	7250.0	3.6105	0.38	.	.	.	.
7	GRB	2501.0	SALT	RSI	725.0	6684.5	3.9585	0.41	.	.	.	.
8	HAR	2456.9	SALT	ARA	3000.0	3900.0	3.7000	0.28	14630	7970	4.81	0.30
9	HAR	2461.8	SALT	ARA	2000.0	3470.0	2.7800	0.30	14900	6130	4.95	0.31
10	HAR	2478.0	SALT	ARA	1000.0	3300.0	5.1000	0.21	14700	7310	4.17	0.34
11	HAR	2491.2	SALT	ARA	3000.0	3060.0	5.7500	0.28	15100	6520	5.32	0.27
12	HAR	2703.5	SALT	ARA	0.0	2350.0	4.1700	0.26	15060	7850	4.75	0.31
13	HOL	2591.6	SALT	ARA	2000.0	2600.0	4.3900	0.21	14500	7200	4.10	0.34
14	HOL	2607.2	SALT	ARA	2000.0	3200.0	3.4200	0.21	14600	7420	4.26	0.33
15	HOL	2633.2	SALT	ARA	0.0	3750.0	4.9500	0.28	14720	7200	4.15	0.34
16	HOL	2693.3	SALT & CLAYSTONE	ARA	2000.0	3400.0	5.3200	0.40	14910	7050	3.94	0.36
17	JFR	2567.7	DIRTY SALT	ARA	725.2	3315.0	4.4200	0.14	14770	7980	4.81	0.29
18	JFR	2604.0	SALT	RSI	0.0	3813.5	3.1030	.	.	.	.	.
19	JFR	2607.1	CLEAN SALT	ARA	3626.0	3585.0	4.2400	0.14	15440	7040	4.00	0.37
20	JFR	2630.0	SALT	RSI	0.0	3929.5	3.5940	.	.	.	.	.
21	JFR	2642.0	CLEAN SALT	ARA	2176.0	4190.0	4.3500	0.14	15120	7820	4.73	0.32
22	JFR	2665.0	SALT	RSI	0.0	4045.5	3.6105	.	.	.	.	.
23	JFR	2685.0	SALT	RSI	0.0	4959.0	3.9150	.	.	.	.	.
24	JFR	2704.2	DIRTY SALT	ARA	1450.0	3780.0	4.0300	0.26	14640	7330	4.27	0.34
25	ZEE	2811.0	SALT	RSI	2175.0	9236.5	4.3045	0.28	.	.	.	.
26	ZEE	2814.0	SALT	RSI	1450.0	8845.0	4.3935	0.30	.	.	.	.

J.O. OR N.O. NO
13697.62

DIVISION & GROUP
GEOTECH (BOSTON)

CALCULATION NO.
13697-82

OPTIONAL TASK CODE
N/A

101

STATISTICAL ANALYSIS OF ROCK MECHANICS LAB TEST DATA - ALL FORMATIONS

10:01 THURSDAY, SEPTEMBER 26, 1985

RXGROUP=SALTS

UNIVARIATE

VARIABLE=PVEL

MOMENTS		QUANTILES(DEF=4)				EXTREMES					
N	74	SUM MGTS	74	100% MAX	16900	99%	16900	LOWEST	ID	HIGHEST	ID
MEAN	14693	SUM	1087285	75% Q3	15152.5	95%	16685	10075(	2029.3)	16620(	2410.4)
STD DEV	1158.9	VARIANCE	1343059	50% MED	14800	90%	15850	10540(	1405.6)	16680(	2458.8)
SKEWNESS	-1.45089	KURTOSIS	4.80352	25% Q1	14342.5	10%	13395	11800(	1439.9)	16700(	2239)
USS	1.607E+10	CSS	98043341	0% MIN	10075	5%	12610	12880(	2153.1)	16900(	1380)
CV	7.88744	STD MEAN	134.72	RANGE	6825	1%	10075	12900(	1062.8)	16900(	1452.5)
T:MEAN=0	109.864	PROB>|T|	0.0001	Q3-Q1	610						
SGN RANK	1387.5	PROB>|S|	0.0001	MODE	14800						
RUN = 0	74										

MISSING VALUE
COUNT 242
% COUNT/TOTALS 76.58

STEM LEAF	#
16 67799	5
16 1	1
15 5677789	7
15 00111111122344	14
14 555566777778888888889999	27
14 11223334	8
13 6889	4
13 334	3
12 99	2
12	0
11 8.	1
11	*
10 5	1
10 1	1

MULTIPLY STEM.LEAF BY 10**+03

BOXPLOT



NORMAL PROBABILITY PLOT

