



Engineers
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February 26, 1993
SEF35300.B0

Mr. Paul J. Mitchell, P.E.
Director of Operations and Engineering
Florida Keys Aqueduct Authority
1100 Kennedy Drive
Key West, FL 33041-1239

Dear Paul:

Subject: Aquifer Storage and Recovery Test Program at Stock Island, Florida

Introduction

This letter report was prepared to describe the results of the recently completed pumping test and water quality testing at the Florida Keys Aqueduct Authority (FKAA) Aquifer Storage and Recovery (ASR) site in Stock Island, Florida. This information is also provided to satisfy the cooperative agreement between FKAA and the South Florida Water Management District (SFWMD) regarding this project. The previous scope of work in this agreement included a 72-hour pumping test. As proposed by CH2M HILL because of the different subsurface conditions at Stock Island, and agreed to by FKAA and SFWMD, the revised scope of work for this task includes conducting a 24-hour single-well pumping test and analyzing native aquifer water for primary and secondary drinking water standards parameters. The report contains background information, presents pumping test results, and discusses water quality data. All raw data and analyses are presented as attachments.

Background

The Phase I investigation of ASR at the Stock Island site was conducted in the second half of 1991 (CH2M HILL, 1992). Figure 1 is a project location map and Figure 2 shows the site layout. Coring and drilling conducted at the observation borehole (OW-1) during Part I of this program indicated that the unconsolidated sand/gravel zone used for ASR purposes at Marathon was not present at Stock Island. However, a limestone interval from approximately 680 to 716 feet below land surface (bls) was identified as a potential zone for storage of potable water. This interval is confined above by approximately 430 feet of low-permeability sediments, which would tend to impede vertical flow of the more buoyant injected waters from within the storage interval. OW-1 is cased to 32 feet bls and has open-hole construction to a maximum depth of 660 feet bls. The OW-1 borehole was not used further due to drilling difficulties and borehole cave-in, and work was begun at ASR-1.

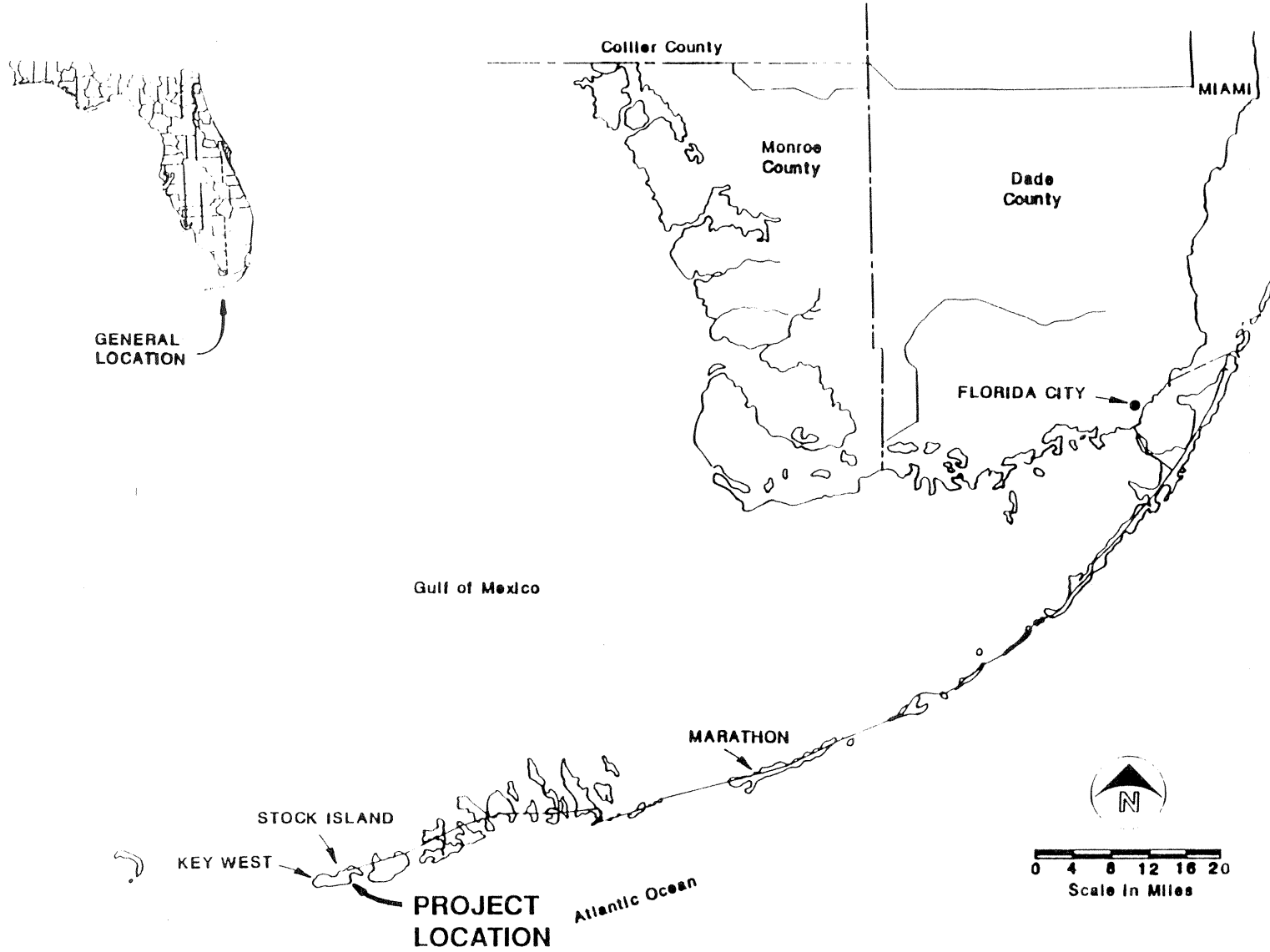
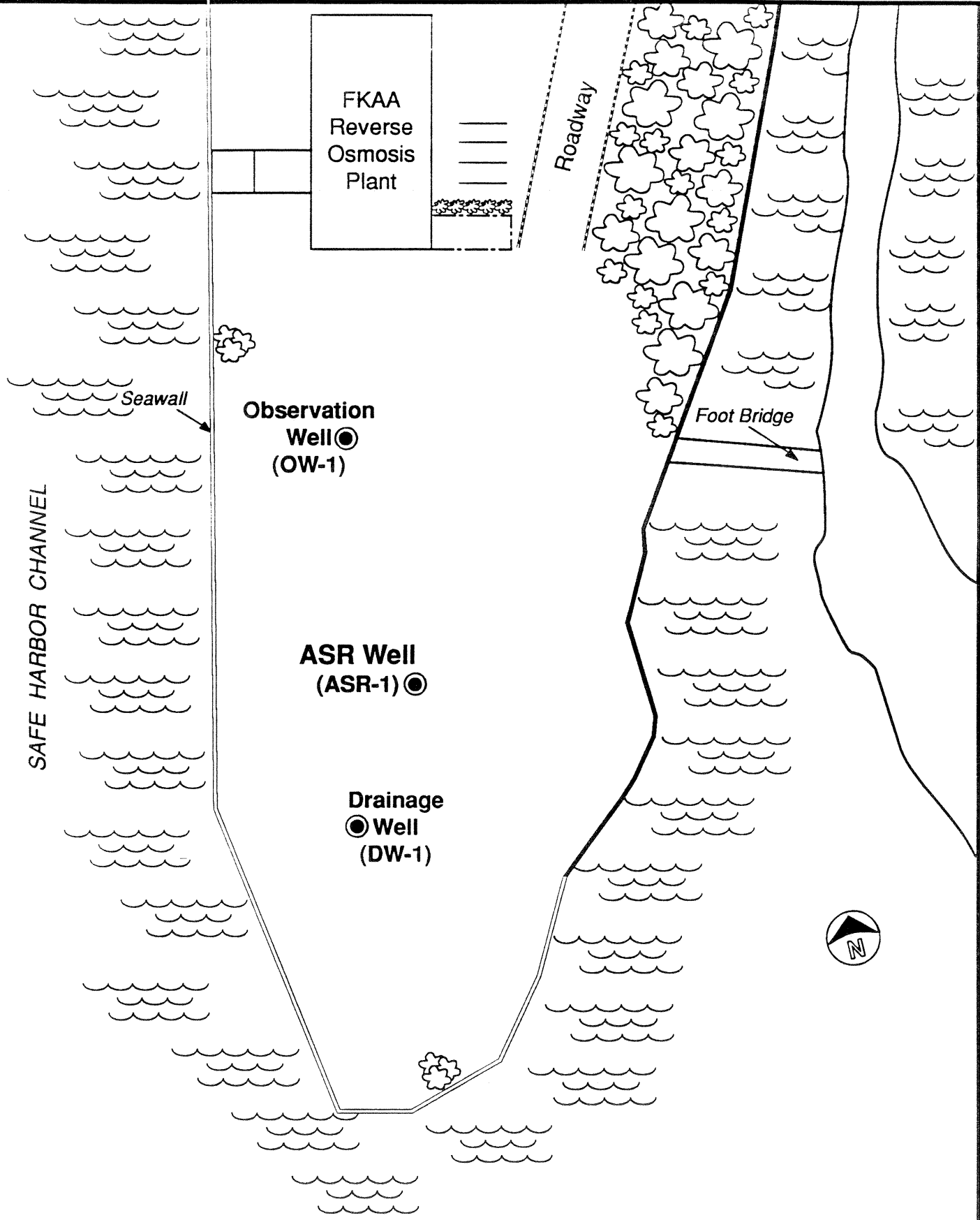


FIGURE 1 [©]
Project Location Map





Well Distances

ASR-1 to OW-1: 109 ft

ASR-1 to DW-1: 63 ft

FIGURE 2
Site Layout



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A 16-inch-diameter ASR well was constructed with steel casing from land surface to 680 feet bls. Figure 3 is a summary of lithologic and geophysical logs conducted during Phase I, and also includes a well construction diagram of ASR-1. The ASR-1 borehole was advanced to a depth of 750 feet bls, but lower confinement was not identified in the drill cuttings. The borehole was plugged back with neat cement from 750 to 716 feet bls; therefore, the open-hole interval from 680 to 716 feet bls is the target ASR zone. Geophysical logging and specific capacity testing were conducted to determine preliminary hydraulic characteristics of this zone. Results of this testing indicate a specific capacity of 3.2 gallons per minute per foot (gpm/ft). Based on the fluid resistivity log conducted during the first short-term pumping test, the native aquifer water is saltwater (CH2M HILL, 1992).

→ 36' thick zone

Pumping Test

Pumping Test Operation

A 24-hour single-well pumping test was conducted to determine aquifer characteristics (i.e. transmissivity) at the site. A 15-horsepower Grundfos electric submersible pump was permanently installed in ASR-1. Three-inch-diameter stainless steel pump column pipe was installed to convey pumped water from the pump to aboveground piping, and ultimately to the 12-inch-diameter drainage well for disposal (see Figure 2). The well was pumped at an approximate rate of 200 gallons per minute (gpm), as measured by a Rockwell totalizing flowmeter, in line with the aboveground piping.

The pumping test began on February 17, 1993, at 8:45 a.m. ASR-1 was pumped and water levels were measured in this well and the open borehole designated as OW-1, approximately 105 feet from ASR-1 as shown in Figure 2. Water levels were measured in OW-1 to observe if any useful data regarding effects of pumping could be observed a short distance away from ASR-1.

A Hermit 1000C data logger was used to obtain water level data at regular timed intervals at ASR-1 and OW-1 throughout the test. Two pressure transducers (50 and 30 pounds per square inch [psi]) were used in ASR-1 and OW-1, respectively. The data logger was programmed to record water levels at logarithmic intervals so that readings were obtained frequently at the beginning of the test and less frequently as the test progressed. This data recording frequency corresponds with the rate of water level change during a pumping test. Manual water level measurements were also taken with an electrical water level indicator (M-scope) as backup data. Comparison of the data logger output and manual water level readings indicates good agreement between the two data sets. Data logger output and field data sheets for the pumping test are contained in Attachment A.

Depth (Feet)	Lithologic Description	Geologic Age	Geologic Formation Name	Productivity
0 - 50	OOLITIC LIMESTONE , very pale orange (10 YR 8/2). Approximately 20% pelecypod and gastropod shell fragments.	Pleistocene	Miami Limestone	High Permeability
50 - 200	LIMESTONE , very pale orange (10 YR 8/2) variable coralline and shell quantities. Trace recrystallized limestone fragments.		Key Largo Limestone	
200 - 250	SANDY LIMESTONE , yellowish gray (5Y 8/1) very fine cuttings, shell fragments include pelecypods, mollusks, etc. Trace coralline material.	Pliocene	Tamiami Formation	
250 - 700	CLAYEY SANDSTONE , pale olive (10 Y 6/2) very fine-fine grained, poor-moderately consolidated with calcareous cement. Approximately 5% very fine black phosphorite. As Above, moderately consolidated.	Miocene	Peace River Formation	Low Permeability
700 - 750	LIMESTONE , tan, fossiliferous dolomitic. Alternating hard and soft layers. Cavity @ 730' bis		Arcadia Formation	

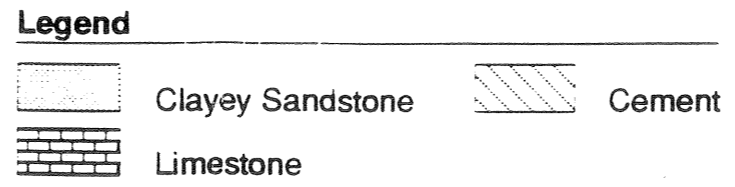
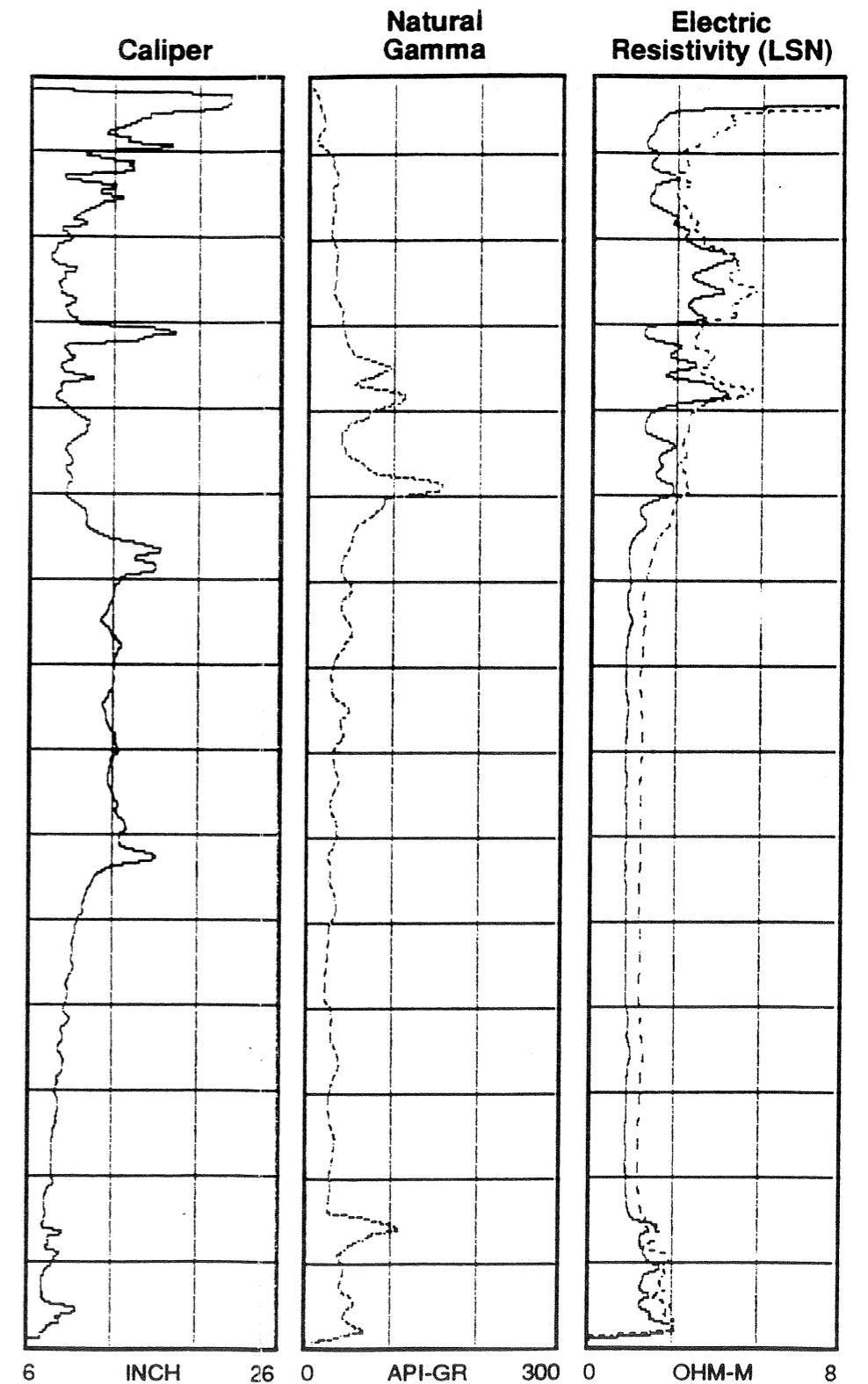
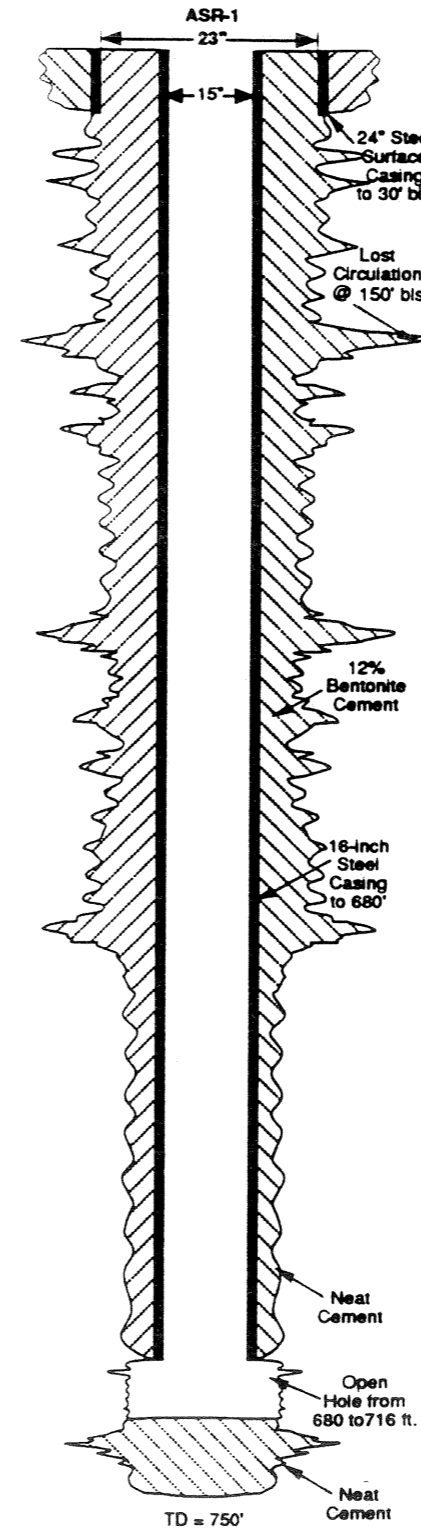
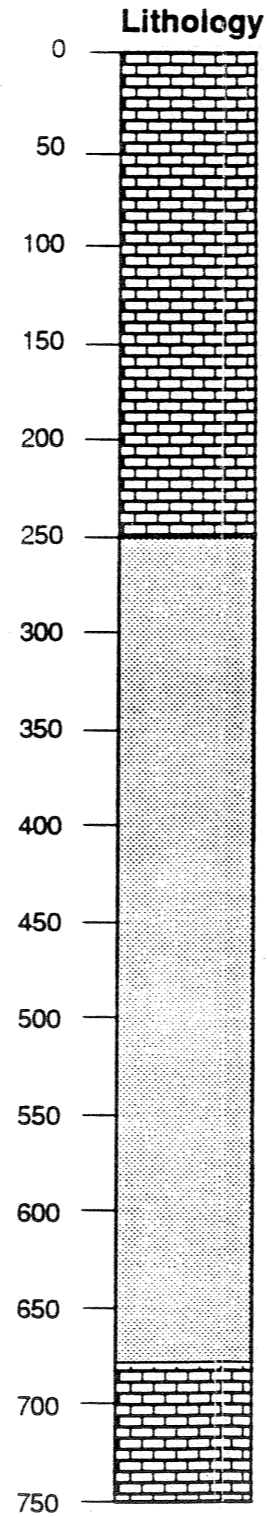


FIGURE 4
Generalized Construction Details and Lithologic Features for the ASR Well in Stock Island, Florida



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Following approximately 24 hours of operation, the pump was shut off at 8:50 a.m. on February 18, 1993, and water levels were allowed to recover to pre-pumping (static) levels. Water levels were also recorded during recovery, both manually and at logarithmic intervals with the data logger.

Data Analysis

During the 24-hour pumping test, it became evident that water level fluctuations in the OW-1 borehole were not responding to the effects of pumping at ASR-1, but instead to natural tidal fluctuations. The rise and fall of water levels without correlation to effects of the pumping test are evident from the field data sheets in Attachment A. Therefore, this data was not evaluated for aquifer characteristics, and only drawdown data from ASR-1 were analyzed.

The drawdown data were evaluated with the Cooper-Jacob (1946) and Theis recovery methods (Kruseman and DeRidder, 1970). For the Cooper-Jacob (1946) methodology, a semilogarithmic graph of drawdown versus time was developed for ASR-1. For the Theis recovery method, a graph of residual drawdown versus a time ratio (t/t') were plotted on semilogarithmic paper to determine transmissivity. Residual drawdown is defined as the difference between the static water level before pumping and the depth to water after pump shutdown. The time ratio is defined as the time since water level recovery started to the total time since pumping began. These graphs and analytical calculations are contained in Attachment B.

Both of the analytical techniques described above assume that the aquifer tested is perfectly confined. One of the limitations of single-well pumping tests is that more robust analytical techniques cannot be applied (i.e., aquifer properties such as leakage from semi-confining units cannot be determined from single-well tests). Storativity—defined as the amount of water released from storage in a unit width of aquifer under a unit decrease in hydraulic head—could not be determined because of inherent limitations of the analytical methods for single-well pumping tests.

Pumping Test Results

The totalizer on the flowmeter registered 287,000 gallons pumped during the 1445 minutes of pumping, yielding an average flow of 198.6 gpm for the test. This pumping rate was used in the Theis recovery method calculations. The Theis recovery method yielded a transmissivity value of 1,164 gallons per day per foot (gpd/ft) as shown in the corresponding graph in Attachment B. The Cooper-Jacob analytical technique was applied on two segments of the drawdown versus time curve for ASR-1. This was performed because the pumping rate in the first two minutes of the test was approximately 300 gpm, and then corrected to the desired rate of 200 gpm thereafter. Therefore, two different straight-line segments on the drawdown versus time curve could be drawn

$$b = 36'$$
$$T = 7.48 / 1164 = 155.6 \frac{\text{ft}^2}{\text{DAY}}$$
$$R = 155.6 = 4.32 \frac{\text{ft}^2}{\text{DAY}} \times 164$$

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corresponding to the two different flow rates. Transmissivity values of 2,112 and 2,400 gpd/ft were obtained, corresponding to the 300 and 200 gpm portions of the curve, respectively.

A specific capacity value of 3.6 gpm/ft was calculated based on a pumping rate of 198.6 gpm and a maximum drawdown of approximately 55 feet in ASR-1. This value is close to the specific capacity value of 3.2 gpm/ft obtained during preliminary testing during well construction (CH2M HILL, 1992).

Water Quality

Sampling

A water quality sample was obtained from ASR-1 and analyzed for primary and secondary drinking water standards parameters. These parameters include volatile organic compounds (VOCs), ethylene dibromide (EDB), pesticides, herbicides, PCBs, inorganics, and physical, microbiological, and radiological parameters. The purpose of this sampling and analysis was to characterize baseline water quality of the proposed storage zone.

ASR-1 was purged for approximately 9 hours with a Honda centrifugal pump at an approximate rate of 40 gpm on January 29, 1993. This methodology effectively purged the well of stagnant water residing in and around the well casing. Following purging, water samples were obtained directly from the pump discharge line and placed in appropriate containers for shipment to the CH2M HILL laboratory in Alachua, Florida for analysis. Quality assurance/quality control (QA/QC) samples included a travel blank to be analyzed for VOCs.

Laboratory Analytical Results

A laboratory analytical report for this sampling event is contained in Attachment C. Table 1 is a summary of major ions and general parameters. Results indicate that the water sample was below method detection limits for VOCs, EDB, pesticides, herbicides, and PCBs. Parameters exceeding maximum contaminant levels (MCLs) include color (50 color units), chloride (19,900 milligrams per liter [mg/l]), sulfate (3,100 mg/l), total dissolved solids (TDS; 37,100 mg/l), turbidity (20 nephelometric [NTUs]), iron (1.56 mg/l), and sodium (9,670 mg/l). Gross alpha was reported at a concentration of 109 picocuries per liter (pc/l), [+/- 221 pc/l] due to the high TDS concentrations. The holding times for coliform and foaming agents unfortunately were not met, and this data is unavailable.

Inspection of this water quality data indicates that the sample closely resembles seawater. High concentrations of TDS, chloride, sodium, and sulfate and a near neutral pH (7.3)

Table 1
Summary of Physical Parameters and Major Ions
Stock Island ASR

Compound	Value
Color	50 color units
Chloride	19,900 mg/l
Saturation Index	0.40
Fluoride	0.84 mg/l
Nitrite	<0.02 mg/l
Nitrate	0.05 mg/l
pH	7.30
Sulfate	3,100 mg/l
TDS	37,100 mg/l
Turbidity	20 NTUs
Silver	<0.005 mg/l
Arsenic	0.008 mg/l
Barium	0.020 mg/l
Cobalt	0.006 mg/l
Chromium	<0.006 mg/l
Copper	<0.006 mg/l
Iron	1.56 mg/l
Mercury	0.0003 mg/l
Manganese	0.026 mg/l
Sodium	9,670 mg/l
Lead	<0.010 mg/l
Selenium	0.027 mg/l
Zinc	<0.005 mg/l

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support this conclusion. This is consistent with results of the fluid resistivity log conducted following well installation (CH2M HILL, 1992). This log showed a low resistivity (high conductivity) borehole fluid similar to seawater. Because of this seawater composition and high TDS content, additional water samples during the pumping test were not deemed necessary because variations in seawater chemistry would be slight at such a high TDS content. Based on the TDS concentration and the confined conditions of the target ASR zone, this zone is classified as a G-IV aquifer. The high iron content may be partially related to residual corrosion of the steel casing during the past year while the well was idle.

Recommendations

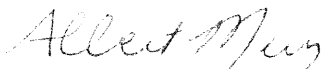
CH2M HILL recommends that this testing program continue with commencement of cycle testing at the Stock Island ASR site to evaluate the storage potential of the target ASR zone. As we have discussed previously, the initial cycle should consist of a 10 million gallon volume of potable water injected at a rate of 200 gpm. Recovery should proceed immediately after injection (i.e. no storage interval) at a rate of 200 gpm until the 250 mg/l chloride value is observed. We will contact you next week to discuss scheduling, coordination with FKAA staff, and logistics of implementing this task.

Sincerely,

CH2M HILL



Peter J. Kwiatkowski, P.G.
Project Manager



Albert Muniz, P.E.
Program Manager

set/1001221D.DFB

cc: Jim Weeks/FKAA
John Larkin/FKAA
Ken Williams/CH2M HILL/KWF
Jeff Giddings/SFWMD/West Palm Beach
Jim Smith/SFWMD/Marathon

Inject 34.7 days at 200 gpm to get 10MG volume

What is the consultant's professional opinion about the nature of the zone tested and its ability to store water? How does this zone compare with other successful ASR experiences.

- What type of porosity exists in the tested zone, i.e. cavity solution holes; secondary porosity or is it intergranular porosity.
- I calculate a K of 4.3 ft/day in the 36' thick ASR zone, is this too low to accept large injected volumes.
- What are the consultant's reasons for using 10 MG as an initial injection cycle.

Please have CH2M elaborate and share their

• Do we know static head, please report
• Is water levels in ASR well tidally influenced.
(over)

Attachment A
Pumping Test Data

Data Logger Output

ASR-1 Drawdown		0.0900	-1.838	0.2433	-6.722
SE1000C		0.0933	-2.026	0.2466	-6.816
Environmental Logger		0.0966	-2.089	0.2500	-6.879
02/18 14:34		0.1000	-2.277	0.2533	-6.942
		0.1033	-2.214	0.2566	-7.225
Unit# 00490 Test 0		0.1066	-2.355	0.2600	-7.146
		0.1100	-2.482	0.2633	-7.287
INPUT 1: Level (F)		0.1133	-2.560	0.2666	-7.287
		0.1166	-2.733	0.2700	-7.491
Reference 0.000		0.1200	-2.906	0.2733	-7.601
Linearity 0.090		0.1233	-2.984	0.2766	-7.523
Scale factor 49.600		0.1266	-3.126	0.2800	-7.774
Offset -0.130		0.1300	-3.141	0.2833	-7.727
Delay mSEC 50.000		0.1333	-3.283	0.2866	-7.884
		0.1366	-3.487	0.2900	-8.073
Step 0 02/17 08:40:53		0.1400	-3.565	0.2933	-8.057
		0.1433	-3.660	0.2966	-8.387
Elapsed Time INPUT 1		0.1466	-3.676	0.3000	-8.308
-----	-----	0.1500	-3.769	0.3033	-8.434
0.0000	0.235	0.1533	-3.942	0.3066	-8.685
0.0033	0.235	0.1566	-4.068	0.3100	-8.356
0.0066	0.219	0.1600	-4.099	0.3133	-8.842
0.0100	0.235	0.1633	-4.241	0.3166	-8.654
0.0133	0.219	0.1666	-4.224	0.3200	-9.031
0.0166	0.219	0.1700	-4.539	0.3233	-9.046
0.0200	0.219	0.1733	-4.445	0.3266	-8.999
0.0233	0.046	0.1766	-4.649	0.3300	-9.501
0.0266	-1.838	0.1800	-4.822	0.3333	-9.031
0.0300	-3.314	0.1833	-4.806	0.3500	-9.628
0.0333	-1.272	0.1866	-4.979	0.3666	-10.067
0.0366	0.250	0.1900	-5.073	0.3833	-10.601
0.0400	-0.974	0.1933	-5.120	0.4000	-11.324
0.0433	-0.142	0.1966	-5.403	0.4166	-11.606
0.0466	-0.424	0.2000	-5.418	0.4333	-12.124
0.0500	-0.754	0.2033	-5.544	0.4500	-12.579
0.0533	-0.502	0.2066	-5.591	0.4666	-13.270
0.0566	-0.943	0.2100	-5.701	0.4833	-13.568
0.0600	-0.691	0.2133	-5.811	0.5000	-13.882
0.0633	-0.974	0.2166	-5.984	0.5166	-14.291
0.0666	-1.304	0.2200	-6.047	0.5333	-14.730
0.0700	-1.099	0.2233	-5.984	0.5500	-14.966
0.0733	-1.304	0.2266	-6.220	0.5666	-15.484
0.0766	-1.586	0.2300	-6.282	0.5833	-16.143
0.0800	-1.570	0.2333	-6.345	0.6000	-16.520
0.0833	-1.492	0.2366	-6.612	0.6166	-16.803
0.0866	-1.791	0.2400	-6.612	0.6333	-17.289

0.6500	-17.682	6.0000	-45.912	62.0000	-54.616
0.6666	-18.059	6.2000	-46.336	64.0000	-54.679
0.6833	-18.435	6.4000	-46.633	66.0000	-54.553
0.7000	-18.938	6.6000	-47.041	68.0000	-54.553
0.7166	-19.236	6.8000	-47.418	70.0000	-54.710
0.7333	-19.613	7.0000	-47.481	72.0000	-54.538
0.7500	-19.911	7.2000	-47.857	74.0000	-54.647
0.7666	-20.414	7.4000	-48.296	76.0000	-54.710
0.7833	-20.728	7.6000	-48.578	78.0000	-53.424
0.8000	-21.167	7.8000	-48.876	80.0000	-53.314
0.8166	-21.575	8.0000	-48.845	82.0000	-52.719
0.8333	-22.030	8.2000	-49.096	84.0000	-52.593
0.8500	-22.156	8.4000	-49.425	86.0000	-52.483
0.8666	-22.470	8.6000	-49.441	88.0000	-52.483
0.8833	-22.941	8.8000	-49.535	90.0000	-52.358
0.9000	-23.506	9.0000	-49.661	92.0000	-52.468
0.9166	-23.710	9.2000	-49.833	94.0000	-53.048
0.9333	-23.929	9.4000	-50.303	96.0000	-53.613
0.9500	-24.510	9.6000	-50.366	98.0000	-54.820
0.9666	-24.981	9.8000	-50.837	100.000	-56.137
0.9833	-24.981	10.0000	-50.774	120.000	-57.172
1.0000	-25.358	12.0000	-51.495	140.000	-57.297
1.2000	-29.391	14.0000	-52.138	160.000	-55.964
1.4000	-33.063	16.0000	-52.327	180.000	-56.168
1.6000	-36.594	18.0000	-52.562	200.000	-55.996
1.8000	-39.292	20.0000	-52.734	220.000	-56.027
2.0000	-40.108	22.0000	-52.828	240.000	-56.074
2.2000	-40.390	24.0000	-52.577	260.000	-55.902
2.4000	-40.798	26.0000	-53.001	280.000	-55.729
2.6000	-41.096	28.0000	-52.280	300.000	-55.008
2.8000	-41.441	30.0000	-52.201	320.000	-55.086
3.0000	-41.896	32.0000	-53.314	340.000	-55.055
3.2000	-42.085	34.0000	-53.926	360.000	-54.961
3.4000	-42.445	36.0000	-54.067	380.000	-54.851
3.6000	-42.618	38.0000	-54.193	400.000	-54.977
3.8000	-42.963	40.0000	-54.349	420.000	-54.992
4.0000	-43.167	42.0000	-54.318	440.000	-55.228
4.2000	-43.355	44.0000	-54.287	460.000	-55.040
4.4000	-43.637	46.0000	-54.553	480.000	-54.929
4.6000	-43.904	48.0000	-54.428	500.000	-54.992
4.8000	-44.171	50.0000	-54.647	520.000	-54.898
5.0000	-44.531	52.0000	-54.553	540.000	-54.914
5.2000	-44.751	54.0000	-54.412	560.000	-54.914
5.4000	-45.159	56.0000	-54.553	580.000	-54.773
5.6000	-45.441	58.0000	-54.585	600.000	-54.961
5.8000	-45.896	60.0000	-54.381	620.000	-54.789

640.000	-54.882
660.000	-54.961
680.000	-55.024
700.000	-54.992
720.000	-54.789
740.000	-54.977
760.000	-54.992
780.000	-54.977
800.000	-55.055
820.000	-55.086
840.000	-55.180
860.000	-55.196
880.000	-55.212
900.000	-55.228
920.000	-55.290
940.000	-55.337
960.000	-55.416
980.000	-55.416
1000.00	-55.337
1200.00	-55.369
1400.00	-55.259

END

ASR-1 Recovery		0.0900	-52.954	0.2433	-49.802
SE1000C		0.0933	-52.875	0.2466	-49.739
Environmental Logger		0.0966	-52.813	0.2500	-49.676
02/18 14:44		0.1000	-52.750	0.2533	-49.598
		0.1033	-52.671	0.2566	-49.535
Unit# 00490 Test 0		0.1066	-52.609	0.2600	-49.472
		0.1100	-52.530	0.2633	-49.394
INPUT 1: Level (F)		0.1133	-52.468	0.2666	-49.331
		0.1166	-52.389	0.2700	-49.268
Reference 0.000		0.1200	-52.327	0.2733	-49.206
Linearity 0.090		0.1233	-52.264	0.2766	-49.127
Scale factor 49.600		0.1266	-52.185	0.2800	-49.065
Offset -0.130		0.1300	-52.123	0.2833	-49.002
Delay mSEC 50.000		0.1333	-52.044	0.2866	-48.939
		0.1366	-51.982	0.2900	-48.861
Step 1 02/18 08:45:43		0.1400	-51.919	0.2933	-48.798
		0.1433	-51.840	0.2966	-48.735
Elapsed Time INPUT 1		0.1466	-51.778	0.3000	-48.672
-----	-----	0.1500	-51.699	0.3033	-48.610
0.0000	-55.259	0.1533	-51.637	0.3066	-48.547
0.0033	-54.490	0.1566	-51.558	0.3100	-48.469
0.0066	-55.086	0.1600	-51.495	0.3133	-48.421
0.0100	-54.820	0.1633	-51.417	0.3166	-48.343
0.0133	-54.522	0.1666	-51.354	0.3200	-48.280
0.0166	-54.538	0.1700	-51.276	0.3233	-48.218
0.0200	-54.412	0.1733	-51.213	0.3266	-48.155
0.0233	-54.381	0.1766	-51.150	0.3300	-48.076
0.0266	-54.334	0.1800	-51.072	0.3333	-48.014
0.0300	-54.287	0.1833	-51.025	0.3500	-47.716
0.0333	-54.193	0.1866	-50.931	0.3666	-47.402
0.0366	-54.114	0.1900	-50.868	0.3833	-47.073
0.0400	-54.036	0.1933	-50.805	0.4000	-46.759
0.0433	-53.957	0.1966	-50.727	0.4166	-46.445
0.0466	-53.895	0.2000	-50.664	0.4333	-46.131
0.0500	-53.816	0.2033	-50.601	0.4500	-45.818
0.0533	-53.754	0.2066	-50.539	0.4666	-45.504
0.0566	-53.675	0.2100	-50.460	0.4833	-45.190
0.0600	-53.597	0.2133	-50.398	0.5000	-44.940
0.0633	-53.518	0.2166	-50.335	0.5166	-44.594
0.0666	-53.456	0.2200	-50.256	0.5333	-44.296
0.0700	-53.377	0.2233	-50.194	0.5500	-43.982
0.0733	-53.314	0.2266	-50.131	0.5666	-43.637
0.0766	-53.236	0.2300	-50.068	0.5833	-43.387
0.0800	-53.158	0.2333	-49.990	0.6000	-43.104
0.0833	-53.095	0.2366	-49.927	0.6166	-42.822
0.0866	-53.032	0.2400	-49.864	0.6333	-42.524

0.6500	-42.226	6.0000	-4.037	62.0000	-0.188
0.6666	-41.943	6.2000	-3.691	64.0000	-0.188
0.6833	-41.661	6.4000	-3.408	66.0000	-0.172
0.7000	-41.379	6.6000	-3.141	68.0000	-0.188
0.7166	-41.096	6.8000	-2.906	70.0000	-0.172
0.7333	-40.830	7.0000	-2.686	72.0000	-0.172
0.7500	-40.547	7.2000	-2.497	74.0000	-0.157
0.7666	-40.281	7.4000	-2.325	76.0000	-0.142
0.7833	-39.998	7.6000	-2.168	78.0000	-0.142
0.8000	-39.716	7.8000	-2.042	80.0000	-0.157
0.8166	-39.449	8.0000	-1.900	82.0000	-0.142
0.8333	-39.182	8.2000	-1.791	84.0000	-0.142
0.8500	-38.916	8.4000	-1.696	86.0000	-0.142
0.8666	-38.665	8.6000	-1.602	88.0000	-0.126
0.8833	-38.382	8.8000	-1.508	90.0000	-0.126
0.9000	-38.115	9.0000	-1.445	92.0000	-0.110
0.9166	-37.864	9.2000	-1.366	94.0000	-0.110
0.9333	-37.629	9.4000	-1.304	96.0000	-0.110
0.9500	-37.331	9.6000	-1.257	98.0000	-0.094
0.9666	-37.096	9.8000	-1.209	100.0000	-0.078
0.9833	-36.845	10.0000	-1.147	120.0000	-0.063
1.0000	-36.578	12.0000	-0.879	140.0000	-0.047
1.2000	-33.691	14.0000	-0.754	160.0000	-0.015
1.4000	-30.929	16.0000	-0.660	180.0000	0.000
1.6000	-28.387	18.0000	-0.613	END	
1.8000	-26.064	20.0000	-0.565		
2.0000	-23.882	22.0000	-0.534		
2.2000	-21.873	24.0000	-0.502		
2.4000	-20.021	26.0000	-0.471		
2.6000	-18.325	28.0000	-0.440		
2.8000	-16.818	30.0000	-0.424		
3.0000	-15.296	32.0000	-0.408		
3.2000	-13.993	34.0000	-0.377		
3.4000	-12.736	36.0000	-0.361		
3.6000	-11.637	38.0000	-0.361		
3.8000	-10.633	40.0000	-0.345		
4.0000	-9.722	42.0000	-0.314		
4.2000	-8.874	44.0000	-0.299		
4.4000	-8.104	46.0000	-0.283		
4.6000	-7.413	48.0000	-0.267		
4.8000	-6.785	50.0000	-0.251		
5.0000	-6.109	52.0000	-0.236		
5.2000	-5.670	54.0000	-0.236		
5.4000	-5.183	56.0000	-0.220		
5.6000	-4.759	58.0000	-0.204		
5.8000	-4.367	60.0000	-0.204		

OW-1 Drawdown		0.0900	0.094	0.2433	0.094
SE1000C		0.0933	0.103	0.2466	0.094
Environmental Logger		0.0966	0.103	0.2500	0.094
02/18 14:39		0.1000	0.103	0.2533	0.094
		0.1033	0.103	0.2566	0.094
Unit# 00490 Test 0		0.1066	0.103	0.2600	0.094
		0.1100	0.103	0.2633	0.103
INPUT 2: Level (F)		0.1133	0.103	0.2666	0.094
		0.1166	0.103	0.2700	0.094
Reference	0.000	0.1200	0.103	0.2733	0.103
Linearity	0.030	0.1233	0.103	0.2766	0.094
Scale factor	29.870	0.1266	0.103	0.2800	0.094
Offset	-0.090	0.1300	0.103	0.2833	0.103
Delay mSEC	50.000	0.1333	0.103	0.2866	0.103
		0.1366	0.103	0.2900	0.094
Step 0 02/17 08:40:53		0.1400	0.103	0.2933	0.094
		0.1433	0.103	0.2966	0.094
Elapsed Time INPUT 2		0.1466	0.103	0.3000	0.103
-----	-----	0.1500	0.103	0.3033	0.094
0.0000	0.094	0.1533	0.103	0.3066	0.094
0.0033	0.094	0.1566	0.094	0.3100	0.094
0.0066	0.094	0.1600	0.094	0.3133	0.094
0.0100	0.094	0.1633	0.094	0.3166	0.094
0.0133	0.094	0.1666	0.094	0.3200	0.094
0.0166	0.094	0.1700	0.094	0.3233	0.094
0.0200	0.094	0.1733	0.094	0.3266	0.094
0.0233	0.094	0.1766	0.094	0.3300	0.094
0.0266	0.094	0.1800	0.094	0.3333	0.094
0.0300	0.094	0.1833	0.094	0.3500	0.094
0.0333	0.094	0.1866	0.094	0.3666	0.085
0.0366	0.094	0.1900	0.094	0.3833	0.094
0.0400	0.094	0.1933	0.094	0.4000	0.085
0.0433	0.094	0.1966	0.094	0.4166	0.094
0.0466	0.094	0.2000	0.094	0.4333	0.094
0.0500	0.094	0.2033	0.094	0.4500	0.094
0.0533	0.094	0.2066	0.094	0.4666	0.094
0.0566	0.094	0.2100	0.094	0.4833	0.094
0.0600	0.094	0.2133	0.094	0.5000	0.094
0.0633	0.094	0.2166	0.094	0.5166	0.094
0.0666	0.094	0.2200	0.094	0.5333	0.094
0.0700	0.094	0.2233	0.094	0.5500	0.094
0.0733	0.103	0.2266	0.094	0.5666	0.094
0.0766	0.094	0.2300	0.094	0.5833	0.094
0.0800	0.094	0.2333	0.094	0.6000	0.094
0.0833	0.094	0.2366	0.094	0.6166	0.094
0.0866	0.094	0.2400	0.094	0.6333	0.094

0.6500	0.094	6.0000	0.103	62.0000	-0.028
0.6666	0.094	6.2000	0.103	64.0000	-0.037
0.6833	0.094	6.4000	0.103	66.0000	-0.047
0.7000	0.094	6.6000	0.103	68.0000	-0.018
0.7166	0.094	6.8000	0.103	70.0000	-0.028
0.7333	0.094	7.0000	0.103	72.0000	-0.018
0.7500	0.094	7.2000	0.103	74.0000	-0.028
0.7666	0.094	7.4000	0.094	76.0000	-0.037
0.7833	0.094	7.6000	0.094	78.0000	-0.047
0.8000	0.094	7.8000	0.094	80.0000	-0.047
0.8166	0.094	8.0000	0.094	82.0000	-0.056
0.8333	0.094	8.2000	0.094	84.0000	-0.056
0.8500	0.094	8.4000	0.094	86.0000	-0.047
0.8666	0.094	8.6000	0.094	88.0000	-0.075
0.8833	0.094	8.8000	0.094	90.0000	-0.094
0.9000	0.094	9.0000	0.094	92.0000	-0.113
0.9166	0.094	9.2000	0.094	94.0000	-0.103
0.9333	0.094	9.4000	0.094	96.0000	-0.094
0.9500	0.094	9.6000	0.094	98.0000	-0.103
0.9666	0.094	9.8000	0.094	100.000	-0.084
0.9833	0.094	10.0000	0.094	120.000	-0.160
1.0000	0.094	12.0000	0.094	140.000	-0.188
1.2000	0.103	14.0000	0.094	160.000	-0.198
1.4000	0.103	16.0000	0.094	180.000	-0.198
1.6000	0.103	18.0000	0.103	200.000	-0.198
1.8000	0.103	20.0000	0.085	220.000	-0.207
2.0000	0.103	22.0000	0.085	240.000	-0.188
2.2000	0.103	24.0000	0.094	260.000	-0.160
2.4000	0.103	26.0000	0.075	280.000	-0.122
2.6000	0.103	28.0000	0.047	300.000	-0.084
2.8000	-0.103	30.0000	0.037	320.000	0.028
3.0000	0.103	32.0000	0.037	340.000	0.056
3.2000	0.103	34.0000	0.028	360.000	0.160
3.4000	0.103	36.0000	0.018	380.000	0.226
3.6000	0.103	38.0000	0.028	400.000	0.302
3.8000	0.103	40.0000	0.028	420.000	0.349
4.0000	0.103	42.0000	0.028	440.000	0.434
4.2000	0.103	44.0000	0.028	460.000	0.500
4.4000	0.103	46.0000	0.037	480.000	0.575
4.6000	0.103	48.0000	0.028	500.000	0.641
4.8000	0.103	50.0000	0.037	520.000	0.670
5.0000	0.103	52.0000	0.028	540.000	0.736
5.2000	0.103	54.0000	0.018	560.000	0.773
5.4000	0.103	56.0000	0.000	580.000	0.811
5.6000	0.103	58.0000	0.000	600.000	0.811
5.8000	0.103	60.0000	-0.018	620.000	0.821

640.000	0.839
660.000	0.811
680.000	0.783
700.000	0.745
720.000	0.679
740.000	0.594
760.000	0.500
780.000	0.415
800.000	0.292
820.000	0.236
840.000	0.141
860.000	0.047
880.000	-0.056
900.000	-0.113
920.000	-0.198
940.000	-0.292
960.000	-0.330
980.000	-0.396
1000.00	-0.396
1200.00	-0.084
1400.00	0.396

END

OW-1 Recovery		0.0900	0.339	0.2433	0.349
SE1000C		0.0933	0.339	0.2466	0.339
Environmental Logger		0.0966	0.339	0.2500	0.349
02/18 14:48		0.1000	0.339	0.2533	0.349
		0.1033	0.339	0.2566	0.339
Unit# 00490 Test 0		0.1066	0.339	0.2600	0.349
		0.1100	0.339	0.2633	0.349
INPUT 2: Level (F)		0.1133	0.339	0.2666	0.339
		0.1166	0.339	0.2700	0.339
Reference	0.000	0.1200	0.339	0.2733	0.339
Linearity	0.030	0.1233	0.349	0.2766	0.349
Scale factor	29.870	0.1266	0.339	0.2800	0.339
Offset	-0.090	0.1300	0.339	0.2833	0.339
Delay mSEC	50.000	0.1333	0.339	0.2866	0.339
		0.1366	0.349	0.2900	0.339
Step 1 02/18 08:45:43		0.1400	0.349	0.2933	0.339
		0.1433	0.349	0.2966	0.339
Elapsed Time INPUT 2		0.1466	0.339	0.3000	0.339
-----	-----	0.1500	0.339	0.3033	0.339
0.0000	0.349	0.1533	0.349	0.3066	0.339
0.0033	0.349	0.1566	0.349	0.3100	0.349
0.0066	0.349	0.1600	0.349	0.3133	0.339
0.0100	0.349	0.1633	0.349	0.3166	0.339
0.0133	0.349	0.1666	0.339	0.3200	0.339
0.0166	0.349	0.1700	0.339	0.3233	0.349
0.0200	0.349	0.1733	0.349	0.3266	0.349
0.0233	0.349	0.1766	0.349	0.3300	0.339
0.0266	0.349	0.1800	0.349	0.3333	0.349
0.0300	0.339	0.1833	0.349	0.3500	0.339
0.0333	0.339	0.1866	0.349	0.3666	0.339
0.0366	0.339	0.1900	0.349	0.3833	0.339
0.0400	0.349	0.1933	0.339	0.4000	0.339
0.0433	0.339	0.1966	0.349	0.4166	0.339
0.0466	0.339	0.2000	0.339	0.4333	0.339
0.0500	0.339	0.2033	0.349	0.4500	0.339
0.0533	0.349	0.2066	0.339	0.4666	0.339
0.0566	0.349	0.2100	0.339	0.4833	0.339
0.0600	0.339	0.2133	0.349	0.5000	0.339
0.0633	0.349	0.2166	0.349	0.5166	0.339
0.0666	0.339	0.2200	0.349	0.5333	0.339
0.0700	0.339	0.2233	0.339	0.5500	0.339
0.0733	0.339	0.2266	0.339	0.5666	0.339
0.0766	0.339	0.2300	0.339	0.5833	0.339
0.0800	0.339	0.2333	0.349	0.6000	0.339
0.0833	0.339	0.2366	0.339	0.6166	0.339
0.0866	0.339	0.2400	0.349	0.6333	0.339

0.6500	0.339	6.0000	0.358	62.0000	0.273
0.6666	0.339	6.2000	0.349	64.0000	0.254
0.6833	0.339	6.4000	0.358	66.0000	0.236
0.7000	0.339	6.6000	0.358	68.0000	0.188
0.7166	0.339	6.8000	0.358	70.0000	0.188
0.7333	0.339	7.0000	0.368	72.0000	0.198
0.7500	0.339	7.2000	0.358	74.0000	0.245
0.7666	0.339	7.4000	0.358	76.0000	0.236
0.7833	0.339	7.6000	0.358	78.0000	0.254
0.8000	0.339	7.8000	0.358	80.0000	0.160
0.8166	0.339	8.0000	0.358	82.0000	0.170
0.8333	0.339	8.2000	0.358	84.0000	0.160
0.8500	0.339	8.4000	0.358	86.0000	0.160
0.8666	0.339	8.6000	0.358	88.0000	0.207
0.8833	0.339	8.8000	0.358	90.0000	0.179
0.9000	0.339	9.0000	0.349	92.0000	0.226
0.9166	0.339	9.2000	0.358	94.0000	0.188
0.9333	0.339	9.4000	0.358	96.0000	0.132
0.9500	0.339	9.6000	0.358	98.0000	0.170
0.9666	0.339	9.8000	0.358	100.000	0.226
0.9833	0.339	10.0000	0.358	120.000	0.160
1.0000	0.339	12.0000	0.358	140.000	0.075
1.2000	0.349	14.0000	0.339	160.000	0.009
1.4000	0.349	16.0000	0.320	180.000	-0.009
1.6000	0.349	18.0000	0.330		
1.8000	0.349	20.0000	0.349	END	
2.0000	0.349	22.0000	0.339		
2.2000	0.349	24.0000	0.339		
2.4000	0.349	26.0000	0.320		
2.6000	0.349	28.0000	0.320		
2.8000	0.349	30.0000	0.283		
3.0000	0.349	32.0000	0.292		
3.2000	0.349	34.0000	0.330		
3.4000	0.349	36.0000	0.330		
3.6000	0.349	38.0000	0.273		
3.8000	0.349	40.0000	0.273		
4.0000	0.349	42.0000	0.273		
4.2000	0.349	44.0000	0.302		
4.4000	0.349	46.0000	0.311		
4.6000	0.349	48.0000	0.311		
4.8000	0.349	50.0000	0.302		
5.0000	0.349	52.0000	0.283		
5.2000	0.349	54.0000	0.273		
5.4000	0.349	56.0000	0.273		
5.6000	0.358	58.0000	0.273		
5.8000	0.349	60.0000	0.292		

Field Data Sheets



PUMPING TEST REPORT

WELL ASR-1 ~~PUMPING~~ OBSERVATION WELL

TYPE OF DATA ~~DRAWDOWN~~ RECOVERY

PUMPED WELL NO. ASR-1 RADIUS 8"

M.P. FOR WL's Top of Flange EL _____

PUMPING RATES Q ≈ 200 gpm

PUMP ON: DATE 2/17/93 TIME 0845

HOW Q MEASURED Rockwell Flowmeter w/ Totalizer

PUMP OFF: DATE 2/18/93 TIME _____

HOW WL'S MEASURED M. Scope

COMMENTS Totalizer (Start) = 4,943,000

DISTANCE FROM PUMPED WELL N/A

TIME SINCE PUMPING START STOPPED (MINUTES)	t/t'	WATER LEVEL			ADJUSTED DRAW-DOWN (ft)	REMARKS
		READINGS		DEPTH TO WATER (ft)		
		REFERENCE	MEASURE			
17/93	N/A	N/A	N/A			
454				64.60	54.4	
514				64.55	54.35	Q ≈ 200 gpm
570				64.55	54.35	Q ≈ 200 gpm
629				64.57	54.37	Q ≈ 200 gpm
694				64.58	54.38	Q ≈ 200 gpm
749				64.67	54.47	Q ≈ 205 gpm
811				64.71	54.51	Q ≈ 198 gpm
868				64.84	54.64	Q = 200 gpm
118/93				65.02	54.82	Q ≈ 200 gpm
988				65.07		Q ≈ 200 gpm
1050				65.33		Q ≈ 200 gpm
1110				65.28		Q ≈ 201 gpm
1169				65.26		Q ≈ 199 gpm
1228				65.05		Q ≈ 200 gpm
1290				64.92		Q ≈ 200 gpm
1352				64.86		Q ≈ 202 gpm
1407				64.94		Q = 200 gpm



PUMPING TEST REPORT

WELL ASR-1 PUMPING OBSERVATION WELLTYPE OF DATA DRAWDOWN/RECOVERYPUMPED WELL NO. ASR-1 RADIUS 8"M.P. FOR WL's Top of Flange EL PUMPING RATES Q ≈ 200 gpmPUMP ON: DATE 2/17/93 TIME 0845HOW Q MEASURED Rockwell Flowmeter w/ TotalizerPUMP OFF: DATE 2/18/93 TIME HOW WL's MEASURED M-ScopeCOMMENTS Totalizer Start = 4943000DISTANCE FROM PUMPED WELL

TIME SINCE PUMPING (START/ STOPPED) MINUTES	t/t'	WATER LEVEL				ADJUSTED DRAWDOWN (ft)	REMARKS
		READINGS		DEPTH TO WATER (ft)	DRAW-DOWN (ft)		
		REFERENCE	MEASURE				
2/16/93 1813	N/A	N/A		9.53	-	Top of Flange - Static Reading	
2/17/93 0810				10.15	-		
0844				10.20	-	Static	
0845				10.20	-	Start Pumping	
45 secs				36.0	20.8		
2 min				49.0	38.8	Flow ≈ 300 gpm	
3 min				47.0	36.8	Flow ≈ 190 gpm	
5 min				54.0	43.8	Flow ≈ 200 gpm	
17 min				62.0	51.8	" "	
20 min				62.2	52.0		
25 min				62.37	52.17	Flow ≈ 190 gpm Adjust flowrate	
32				62.85	52.65	Flow ≈ 200 gpm	
38				63.75	53.55		
45				64.0	53.80		
60				64.1	53.90	Flow ≈ 200 gpm Totalizer 4955000	
90				62.1	51.90	Flow ≈ 195 gpm Adjust Flowrate	
100				66.4	56.20	Flow ≈ 205 (Compensate for before)	
120				66.7	56.50	Flow ≈ 205 gpm	
152				65.6	55.40	Q = 200 gpm	
180				65.6	55.40	Q = 205 gpm	
265				65.4	55.20	Q = 202 gpm Adjust Flow w/closure	
332				64.6	54.40	Q = 202 gpm	
389				64.7	54.70	Q = 202 gpm	



PUMPING TEST REPORT

WELL ASR-1 PUMPING OBSERVATION WELL

TYPE OF DATA DRAWDOWN RECOVERY

PUMPED WELL NO. ASR-1 RADIUS 8"

M.P. FOR WL's Top of Flange EL _____

PUMPING RATES Q ≈ 200 gpm

PUMP ON: DATE 2/17/93 TIME 0845

HOW Q MEASURED Rockwell Flowmeter

PUMP OFF: DATE 2/18/93 TIME 0850

HOW WL'S MEASURED M-Scope

COMMENTS Totalizer Final Reading:

DISTANCE FROM PUMPED WELL N/A

5,230,000 gals

TIME SINCE PUMPING START/ STOPPED (MINUTES)	t/t'	WATER LEVEL			ADJUSTED DRAW-DOWN (ft)	REMARKS
		READINGS		DEPTH TO WATER (ft)		
		REFERENCE	MEASURE			
0				64.99		
0:22 sec				58.0		
0:44 sec				51.5		
min sec 1:10				44.53		
1:27				40.6		
1:46				36.9		
2:13				32.3		
2:35				28.83		
3:53				26.74		
4:29				18.60		
4:47				17.59		
5:25				15.95		
5:41				15.38		
6:11				14.48		
7:04				13.30		
8:33				12.40		
10:00				11.90		
11:03				11.68		
14:08				11.45		
17:05				11.35		
21:04				11.27		
30				11.15		
40				11.08		



PUMPING TEST REPORT

WELL ASR-1 PUMPING OBSERVATION WELL

TYPE OF DATA DRAWDOWN RECOVERY

PUMPED WELL NO. ASR-1 RADIUS 8"

M.P. FOR WL's Top of Flange EL _____

PUMPING-RATES Q ≈ 200 gpm

PUMP ON: DATE 2/17/93 TIME 0845

HOW Q MEASURED Rockwell Flowmeter

PUMP OFF: DATE 2/18/93 TIME 0850

HOW WL's MEASURED M-Scope

COMMENTS _____

DISTANCE FROM PUMPED WELL N/A

TIME SINCE PUMPING START/ STOPPED (MINUTES)	t/t'	WATER LEVEL			ADJUSTED DRAW-DOWN (ft)	REMARKS
		READINGS		DEPTH TO WATER (ft)		
		REFERENCE	MEASURE			
60				10.90		
75				10.85		
90				10.85		
130				10.78		
180				10.75		



PUMPING TEST REPORT

WELL OW-1 PUMPING/OBSERVATION WELL

TYPE OF DATA DRAWDOWN/RECOVERY

PUMPED WELL NO. ASR-1 RADIUS _____

M.P. FOR WL's Top of 2" Threaded Cap EL _____

PUMPING-RATES Q ≈ 200 gpm

PUMP ON: DATE 2/17/93 TIME 0845

HOW Q MEASURED Rockwell Flowmeter w/ Totalizer

PUMP OFF: DATE 2/18/93 TIME 0850

HOW WL'S MEASURED M-Scope

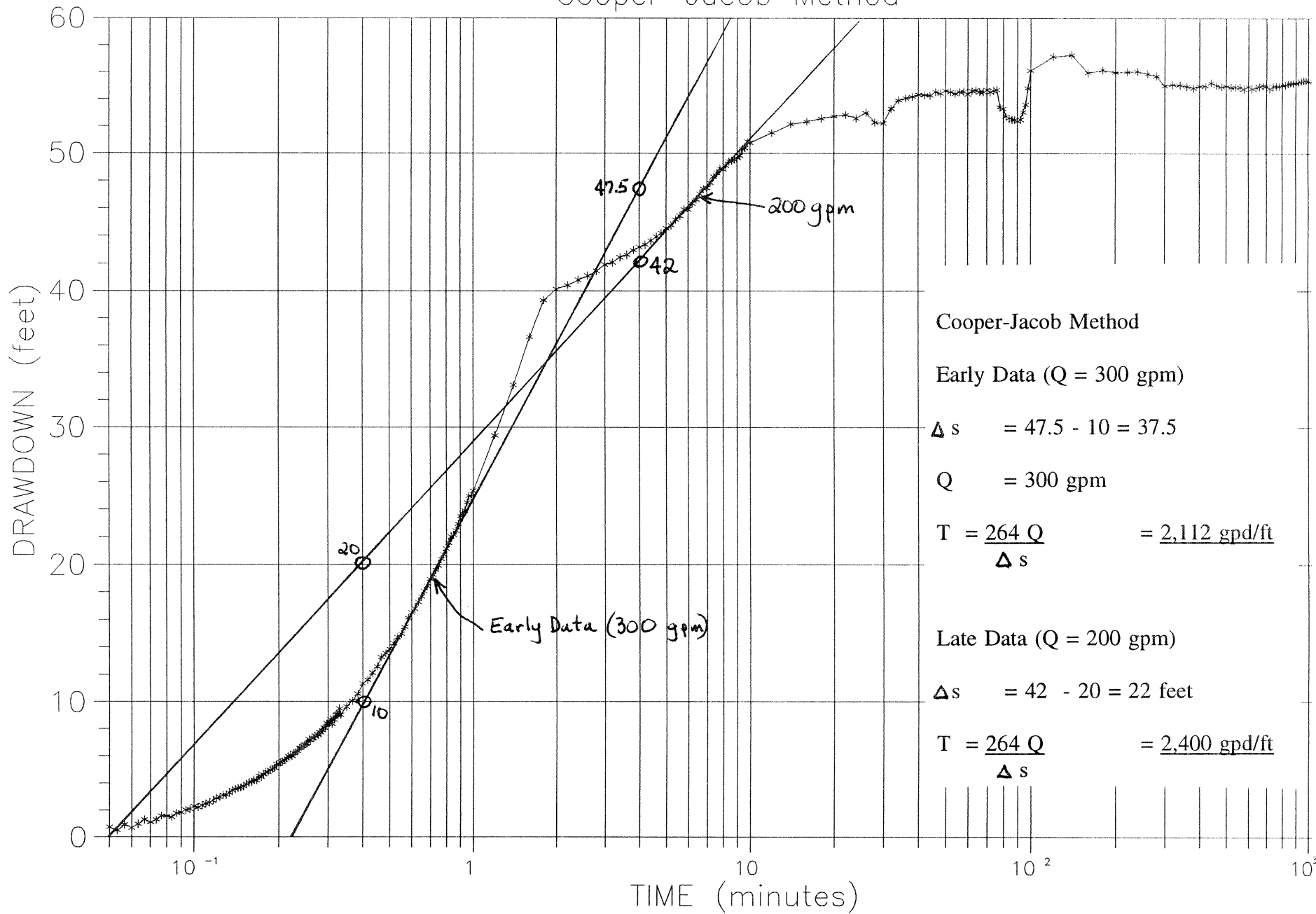
COMMENTS Totalizer (Start) = 4,943,000

DISTANCE FROM PUMPED WELL 105 feet

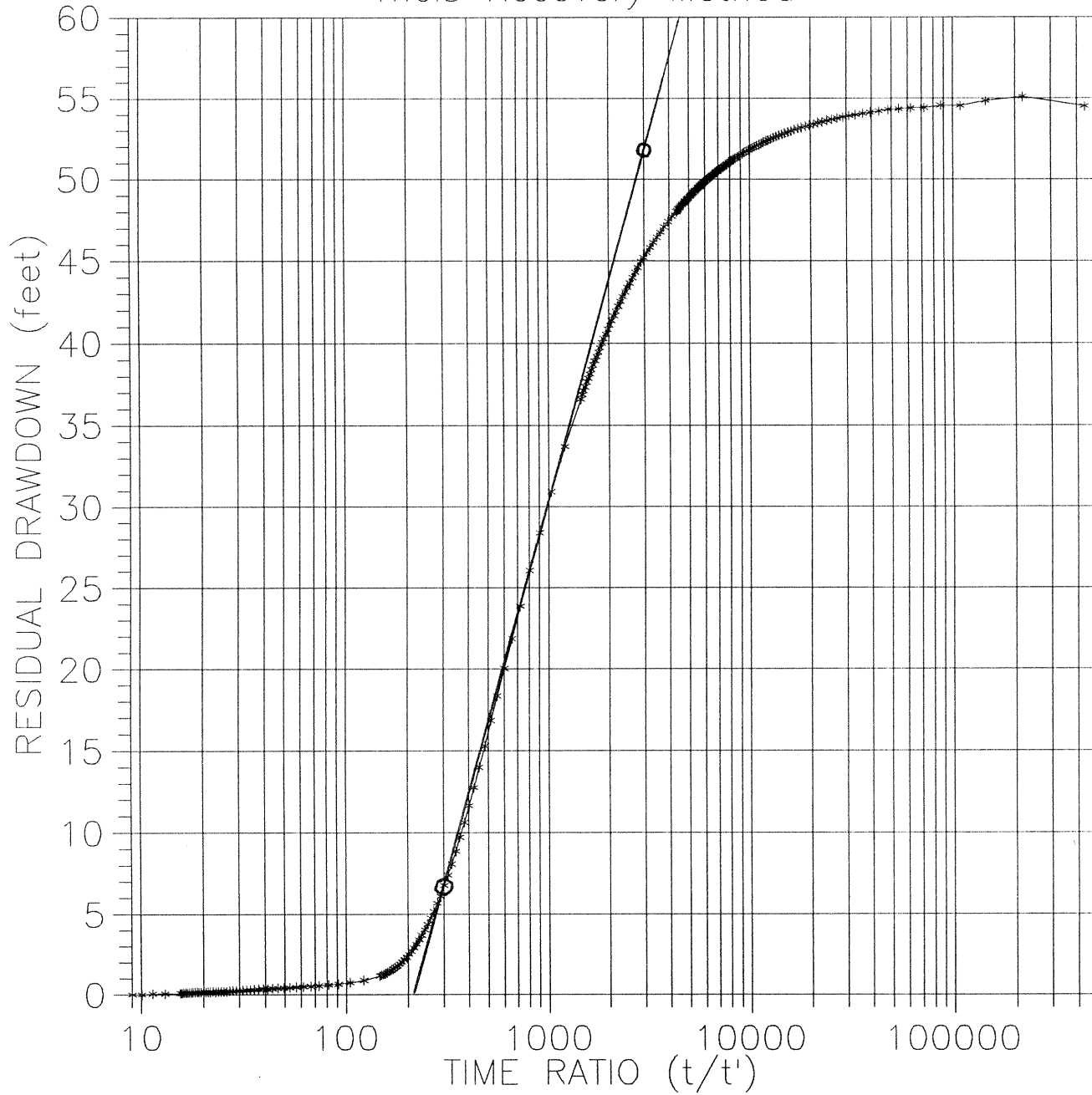
TIME SINCE PUMPING START/ STOPPED (MINUTES)	t/t'	WATER LEVEL				ADJUSTED DRAW-DOWN (ft)	REMARKS
		READINGS		DEPTH TO WATER (ft)	DRAW-DOWN (ft)		
		REFERENCE	MEASURE				
2/16/93 1438				7.67		4936700 = Totalizer Reading	
2/17/93 0811				7.77			
0843				-		Static	
0900 15 min				7.77	0.0		
40				7.85	0.08		
61				7.89	0.12		
89				7.95	0.18		
122				8.01	0.24		
150				8.04	0.27		
182				8.04	0.27		
267				8.01	0.24		
328				7.81	0.04		
393				7.62	+0.09		
451				7.41	+0.36		
512				7.22	+0.55		
572				7.07	+0.70		
631				7.06	+0.71		
691				7.12	0.65		
751				7.35			
813				7.65			
870				7.95			
-1/18/93 930				8.21			
991				8.33			

Attachment B
Pumping Test Analysis

ASR-1
Cooper-Jacob Method



ASR-1
Theis Recovery Method



Theis Recovery Method

$Q = 198.6 \text{ gpm} = 38,233 \text{ ft}^3/\text{day}$

$s' = 52 - 7 = 45 \text{ feet}$

$T = \frac{2.3 Q}{4\pi s'} = 155.58 \text{ ft}^2/\text{day}$

$= \underline{1,164 \text{ gpd/ft}}$

Attachment C
Laboratory Results for Water Quality Sampling



QUALITY
ANALYTICAL
LABORATORIES

February 25, 1993

Albert Muniz
CH2M HILL/DFB

RE: Analytical Data for FCAA/Stock Island
LGN Lab Ref. No. GN-01252

Dear Albert Muniz:

On January 30, 1993, the CH2M HILL Gainesville Laboratory (LGN) received two samples with a request for analysis of selected organic and inorganic parameters.

The analytical results and associated quality control data are enclosed. The samples for pesticides/herbicides were sent to Savannah Laboratories. The samples for gross alpha were sent to Environmental Science & Engineering, Inc(ESE).

Under CH2M HILL policy, your samples will be stored for up to 30 days after reporting. If you have not given us prior instructions for disposal, we will contact you if any samples require disposal as hazardous waste.

CH2M HILL Laboratories appreciate your business and look forward to serving your analytical needs again. If you should have any questions concerning the data, or if you need additional information, please call me or Tom Emenhiser, Client Services Manager, at 904-462-3050.

Sincerely,

Don Hash
Client Services Coordinator

Enclosures

xc:S.Skeehan/DFB

State Certifications:

Florida No. 82112, E82124 Alabama No. 40080 California No. I-1014

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CH2M HILL Lab Ref. No. GN-01252

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ORGANIC DATA QUALIFIERS

- U Indicates the compound was analyzed for, but not detected. The number adjacent to the "U" qualifier indicates the reporting limit for that compound. The reporting limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.
- J Indicates an estimated value. It is used when the data indicates the presence of a compound below the stated reporting limit.
- C This flag applies to GC analytes only. The "C" flag indicates the presence of this compound has been confirmed by GC/MS analysis.
- B This flag is used when the analyte is found in the associated blank, as well as the sample. This notation indicates possible blank contamination and suggests the data user evaluate these compounds and their amounts carefully.
- E This qualifier indicates that the value reported exceeds the linear calibration range for that compound. Therefore, the sample should be reanalyzed at an appropriate dilution. The "E" qualified amount is an estimated concentration, and the results of the dilution will be reported on a separate Form I.
- D This qualifier indicates compounds which have been identified during a diluted reanalysis. "D" qualifiers are used for samples that have been analyzed initially at a lesser dilution than required for accurate quantification.

SAMPLE ID QUALIFIERS

The qualifiers that may be appended to the sample ID for organic analyses are defined below:

- DL or D -- Dilution Run. Indicates the sample contained compounds exceeding the calibration range. The sample was diluted and reanalyzed. Both results are reported.
- R -- Rerun. The sample was reanalyzed. The "R" is not used if the sample was also re-extracted.
- RE -- Re-extraction Analysis. The sample was re-extracted and reanalyzed.
- MS -- Matrix Spike (may be followed by a digit to indicate multiple matrix spikes within a sample set)
- MSD or MD -- Matrix Spike Duplicate (may be followed by a digit to indicate multiple matrix spike duplicates within a sample set)

CLIENT SAMPLE CROSS-REFERENCE

CH2M HILL Lab Ref. No. GN-01252

LGN Lab Sample No.	Client Lab Sample ID.	Savannah Lab Sample No.	ESE Lab Sample No.
GN-01252001	Water Grab	00348-1	CHZRAD93*2
GN-01252002	Travel Blank		

CASE NARRATIVE
Cations

Lab Number: GN-01252

Client/Project: FKAA

- I. Holding Time:
All holding times were met.
- II. Digestion Exceptions:
None
- III. Analysis:
- A. Calibration:
All acceptance criteria were met.
- B. Blanks:
All acceptance criteria were met.
- C. ICP Interference Check Sample:
All acceptance criteria were met.
- D. Spike Sample(s):
In the analysis of Lead, matrix interferences were encountered.
The sample had to be diluted x5 in order to obtain acceptable QC
data. The detection limit was elevated accordingly.
- E. Duplicate Sample(s):
All acceptance criteria were met.
- F. Laboratory Control Sample(s):
All acceptance criteria were met.
- G. ICP Serial Dilution:
Not required for this level QC.
- H. Other:
None.
- IV. Documentation Exceptions:
None
- V. I certify that this data package is in compliance with the terms and
conditions agreed to by the client and CH2M HILL, both technically
and for completeness, except for the conditions detailed above. Release
of the data contained in this hardcopy data package has been authorized
by the Laboratory Manager or his designee, as verified by the following
signature.

SIGNED: Isaac Lynch DATE: 2/24/93
Isaac Lynch
Supervisor, Inorganics Division

000001

CASE NARRATIVE
General Chemistry

Lab Number: GN-01252

Client/Project: FKAA

I. Holding Time:
All holding times were met.

II. Analysis:

A. Calibration:
All acceptance criteria were met.

B. Blanks:
All acceptance criteria were met.

C. Matrix Spike Sample(s):
All acceptance criteria were met.

D. Duplicate Sample(s):
All acceptance criteria were met.

E. Lab Control Sample(s):
All acceptance criteria were met.

F. Other:
None.

III. Documentation Exceptions:
None.

IV. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

SIGNED: Isaac D. Lynch DATE: 2/24/93
Isaac Lynch
Supervisor, Inorganics Division

000002



FKAA	CH2M Hill
Attention: Albert Muniz Address: DFB Copies to: Sean Skehan/DFB	Project No: SEF19915.W4.33 Received: 01/30/93 Reported: 02/24/93
Collected: 01/29/93 by Michael E. Perez Type: water, grab Location: Stock Island ASR	

SAMPLE NUMBER	125201	
SAMPLE DESCRIPTIONS	WATER, GRAB 01/28/93 08:30 pm	Laboratory Method Blank
GENERAL		
pH (Units)	7.30 01/30/93	Not Applicable 01/30/93
Color (APHA)	50 01/30/93	0 01/30/93
Turbidity (NTU)	20 01/30/93	<0.2 01/30/93
Odor (TON)	N.O.O. 01/30/93	N.O.O. 01/30/93
Corrosivity	+0.40 01/30/93	Not Applicable 01/30/93
SOLIDS		
Total Dissolved Solids	37100 02/04/93	<1.0 02/04/93
METALS		
Arsenic, Furnace	0.008 02/24/93	<0.005 02/24/93
Barium, ICP	0.020 02/16/93	<0.001 02/16/93
Cadmium, ICP	0.006 02/08/93	<0.005 02/08/93
Chromium, ICP	<0.006 02/08/93	<0.006 02/08/93

NOTE: Values are mg/l as substance unless otherwise stated.

Respectfully submitted,

Isaac D. Lynch
Isaac D. Lynch, Inorganics Supervisor

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.



SAMPLE NUMBER	125201	125202
SAMPLE DESCRIPTIONS	WATER, GRAB 01/28/93 08:30 pm	Laboratory Method Blank
Copper, ICP	<0.006 02/08/93	<0.006 02/08/93
Iron, ICP	1.56 02/08/93	<0.020 02/08/93
Lead, Furnace	*<0.010 02/17/93	<0.002 02/17/93
Manganese, ICP	0.026 02/16/93	<0.002 02/16/93
Mercury, Cold Vapor	0.0003 02/10/93	<0.0002 02/10/93
Selenium, Furnace	0.027 02/23/93	<0.005 02/23/93
Silver, ICP	<0.005 02/08/93	<0.005 02/08/93
Sodium, ICP	9670 02/16/93	<0.50 02/16/93
Zinc, ICP	<0.005 02/08/93	<0.005 02/08/93
ANIONS		
Chloride	19900 02/09/93	<1.0 02/09/93
Fluoride	0.84 02/03/93	<0.01 02/03/93
Sulfate	3100 02/11/93	<1.0 02/11/93
NUTRIENTS		
Nitrate (as N)	0.05 01/30/93	<0.02 01/30/93
Nitrite (as N)	<0.02 01/30/93	<0.02 01/30/93

NOTE: Values are mg/l as substance unless otherwise stated.

* See case narrative.

Respectfully submitted,

Isaac D. Lynch
Isaac D. Lynch, Inorganics Supervisor

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.

CASE NARRATIVE
GC VOLATILE SAMPLES

LABORATORY: CH2M HILL LABORATORIES CLIENT: FKAA Stock Island ASR
CASE NO. : N/A CONTRACT NO.: N/A
LAB NO. : GN-01252-001-002 SDG NO.: GN-01252

I. RECEIPT

A. DATE: JANUARY 30, 1993

B. SAMPLE INFORMATION

<u>LAB</u> <u>SAMPLE ID</u>	<u>CLIENT</u> <u>SAMPLE ID</u>	<u>SAMPLE</u> <u>MATRIX</u>	<u>DATE</u> <u>SAMPLED</u>	<u>EXTRACTION</u> <u>DATE</u>	<u>ANALYSIS</u> <u>DATE</u>
01252001	GRAB WATER	WATER	01/28/93	N/A	02/01/93
01252002	TRVL BLK	WATER	01/28/93	N/A	02/01/93
2VBB01A	VBLK001	WATER	N/A	N/A	02/01/93

C. Documentation

Exceptions: No exceptions were encountered.

000005

II. EXTRACTION

- A. Holding Times: Not applicable.
- B. Extraction
Exceptions: Not applicable.


III. ANALYSIS

- A. Holding times: All holding times were met.
- B. Analytical
Exceptions: There were no analytical exceptions.

IV. QUALITY CONTROL

- A. Method Blank: All samples met acceptable QC criteria.
- B. Surrogate
Recoveries: All samples met acceptable QC criteria.
- C. Matrix Spike
Results: Some compounds were outside acceptable limits for accuracy and/or precision. However, analysis of a continuing calibration standard immediately after the matrix spikes indicated that the analytical system was in control. Since MS/MSD results are subject to matrix effects, these values should be considered to be advisory.

- V. I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.



Andres A. Romeu, Ph.D.
Manager, Organics Division

2/12/93

Date

GRAB WATER

REPORT OF ANALYTICAL RESULTS
PURGEABLE HALOCARBONS/AROMATICS

Date collected: 1/28/93	Sample Group: GN-01252
Date extracted: N/A	Lab Sample ID: GN-01252001
Date analyzed: 2/1/93	Lab file 1 ID: B01C008
Matrix: Water	Lab file 2 ID: B01D008
Method: 601/602	Dilution Factor: 1.0000
% Moisture: 100	Reporting units: ug/L

CAS NUMBER	COMPOUND NAME	REPORTING LIMIT	RESULT
71-43-2	Benzene	1.0	U
75-27-4	Bromodichloromethane	1.0	U
75-25-2	Bromoform	1.0	U
74-83-9	Bromomethane	1.0	U
56-23-5	Carbon tetrachloride	1.0	U
108-90-7	Chlorobenzene	1.0	U
75-00-3	Chloroethane	1.0	U
67-66-3	Chloroform	1.0	U
74-87-3	Chloromethane	1.0	U
100-75-8	2-Chloroethyl vinyl ether	1.0	U
124-48-1	Dibromochloromethane	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	U
74-71-8	Dichlorodifluoromethane	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
156-59-4	cis-1,2-Dichloroethene	1.0	U
156-60-5	trans-1,2-Dichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1.0	U
10061-02-6	trans-1,3-Dichloropropene	1.0	U
100-41-4	Ethyl Benzene	1.0	U
1634-04-4	Methyl tert butyl ether	1.0	U
75-09-2	Methylene chloride (Dichloromethane)	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
108-88-3	Toluene	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
75-01-4	Vinyl chloride	1.0	U
108-38-3/106-42-3	m- and p-Xylene	2.0	U
95-47-6	o-Xylene	1.0	U
N/A	Total Xylenes	1.0	U
SURROGATE			88 % Rec.

TRAVEL BLANK

REPORT OF ANALYTICAL RESULTS
PURGEABLE HALOCARBONS/AROMATICS

Date collected:	1/28/93	Sample Group:	GN-01252
Date extracted:	N/A	Lab Sample ID:	GN-01252002
Date analyzed:	2/1/93	Lab file 1 ID:	B01C015
Matrix:	Water	Lab file 2 ID:	B01D015
Method:	601/602	Dilution Factor:	1.0000
% Moisture:	100	Reporting units:	ug/L

CAS NUMBER	COMPOUND NAME	REPORTING LIMIT	RESULT
71-43-2	Benzene	1.0	U
75-27-4	Bromodichloromethane	1.0	U
75-25-2	Bromoform	1.0	U
74-83-9	Bromomethane	1.0	U
56-23-5	Carbon tetrachloride	1.0	U
108-90-7	Chlorobenzene	1.0	U
75-00-3	Chloroethane	1.0	U
67-66-3	Chloroform	1.0	U
74-87-3	Chloromethane	1.0	U
100-75-8	2-Chloroethyl vinyl ether	1.0	U
124-48-1	Dibromochloromethane	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	U
74-71-8	Dichlorodifluoromethane	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
156-59-4	cis-1,2-Dichloroethene	1.0	U
156-60-5	trans-1,2-Dichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1.0	U
10061-02-6	trans-1,3-Dichloropropene	1.0	U
100-41-4	Ethyl Benzene	1.0	U
1634-04-4	Methyl tert butyl ether	1.0	U
75-09-2	Methylene chloride (Dichloromethane)	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
108-88-3	Toluene	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
75-01-4	Vinyl chloride	1.0	U
108-38-3/106-42-3	m- and p-Xylene	2.0	U
95-47-6	o-Xylene	1.0	U
N/A	Total Xylenes	1.0	U
SURROGATE			94 % Rec.

VBLK001

REPORT OF ANALYTICAL RESULTS
PURGEABLE HALOCARBONS/AROMATICS

Date collected:	N/A	Sample Group:	GN-01252
Date extracted:	N/A	Lab Sample ID:	2VBB01A
Date analyzed:	2/1/93	Lab file 1 ID:	B01C003
Matrix:	Water	Lab file 2 ID:	B01D003
Method:	601/602	Dilution Factor:	1.0000
% Moisture:	100	Reporting units:	ug/L

CAS NUMBER	COMPOUND NAME	REPORTING LIMIT	RESULT
71-43-2	Benzene	1.0	U
75-27-4	Bromodichloromethane	1.0	U
75-25-2	Bromoform	1.0	U
74-83-9	Bromomethane	1.0	U
56-23-5	Carbon tetrachloride	1.0	U
108-90-7	Chlorobenzene	1.0	U
75-00-3	Chloroethane	1.0	U
67-66-3	Chloroform	1.0	U
74-87-3	Chloromethane	1.0	U
100-75-8	2-Chloroethyl vinyl ether	1.0	U
124-48-1	Dibromochloromethane	1.0	U
95-50-1	1,2-Dichlorobenzene	1.0	U
541-73-1	1,3-Dichlorobenzene	1.0	U
106-46-7	1,4-Dichlorobenzene	1.0	U
74-71-8	Dichlorodifluoromethane	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
156-59-4	cis-1,2-Dichloroethene	1.0	U
156-60-5	trans-1,2-Dichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
10061-01-5	cis-1,3-Dichloropropene	1.0	U
10061-02-6	trans-1,3-Dichloropropene	1.0	U
100-41-4	Ethyl Benzene	1.0	U
1634-04-4	Methyl tert butyl ether	1.0	U
75-09-2	Methylene chloride (Dichloromethane)	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
108-88-3	Toluene	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
79-00-5	1,1,2-Trichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
75-69-4	Trichlorofluoromethane	1.0	U
75-01-4	Vinyl chloride	1.0	U
108-38-3/106-42-3	m- and p-Xylene	2.0	U
95-47-6	o-Xylene	1.0	U
N/A	Total Xylenes	1.0	U
SURROGATE			89 % Rec.

000009

CASE NARRATIVE
GC VOLATILE SAMPLES

LABORATORY: CH2M HILL LABORATORIES CLIENT: FCAA Stock Island ASR
CASE NO. : N/A CONTRACT NO.: N/A
LAB NO. : GN-01252-B01 SDG NO.: GN-01252

I. RECEIPT

A. DATE: JANUARY 30, 1993

B. SAMPLE INFORMATION

<u>LAB</u> <u>SAMPLE ID</u>	<u>CLIENT</u> <u>SAMPLE ID</u>	<u>SAMPLE</u> <u>MATRIX</u>	<u>DATE</u> <u>SAMPLED</u>	<u>EXTRACTION</u> <u>DATE</u>	<u>ANALYSIS</u> <u>DATE</u>
01252B01	GRAB WATER	WATER	01/28/93	02/10/93	02/10/93
3VBB10C	VBLK001	WATER	N/A	02/10/93	02/10/93

C. Documentation

Exceptions: No exceptions were encountered.

II. EXTRACTION

- A. Holding Times: Not applicable.
- B. Extraction
Exceptions: Not applicable.

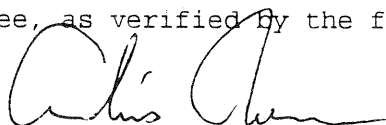
III. ANALYSIS

- A. Holding times: All holding times were met.
- B. Analytical
Exceptions: There were no analytical exceptions.

IV. QUALITY CONTROL

- A. Method Blank: All samples met acceptable QC criteria.
- B. Surrogate
Recoveries: All samples met acceptable QC criteria.
- C. Matrix Spike
Results: All samples met acceptable QC criteria.

- V. I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, except for the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.



Andres A. Romeu, Ph.D.
Manager, Organics Division

2/11/93

Date

GRAB WATER

REPORT OF ANALYTICAL RESULTS
EDB and DBCP

Date collected:	1/28/93	Sample Group:	GN-01252
Date extracted:	2/10/93	Lab Sample ID:	GN-01252B01
Date analyzed:	2/10/93	Lab file 1 ID:	B10E007
Matrix:	WATER	Lab file 2 ID:	B10F007
Method:	504	Dilution Factor:	1.0000
% Moisture:	100	Reporting units:	ug/L

CAS NUMBER	COMPOUND NAME	REPORTING LIMIT	RESULT
106-93-4	1,2-Dibromoethane	0.02	U
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U
SURROGATE			93 % Rec.

VBLK001

REPORT OF ANALYTICAL RESULTS
EDB and DECP

Date collected:	N/A	Sample Group:	GN-01252
Date extracted:	2/10/93	Lab Sample ID:	3VBB10C
Date analyzed:	2/10/93	Lab file 1 ID:	B10E004
Matrix:	Water	Lab file 2 ID:	B10F004
Method:	504	Dilution Factor:	1.0000
% Moisture:	100	Reporting units:	ug/L

CAS NUMBER	COMPOUND NAME	REPORTING LIMIT	RESULT
106-93-4	1,2-Dibromoethane	0.02	U
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U
	SURROGATE		102 % Rec.

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahassee, FL 32317-3056 • (904) 878-3994 • Fax (904) 878-9504

LOG NO: T3-00348

Received: 05 FEB 93

Ms. Nancy Mosurick
CH2M Hill
P.O. Box 370
Alachua, FL 32615

Project: SEF19915.W4.22/FFAA Stock Island ASR
Sampled By: Client

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
00348-1	GN 01252001	01-29-93
PARAMETER		00348-1
Chlorinated Hydrocarbon Pesticides (508)		
Endrin, ug/l		<0.020
Gamma-BHC, ug/l		<0.010
Methoxychlor, ug/l		<0.50
Toxaphene, ug/l		<1.0
Chlorophenoxy Acid Herbicides (515.1)		
2,4-D, ug/l		<0.50
2,4,5-TP Silvex, ug/l		<0.50

000014

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 Sampled By: Client

REPORT OF RESULTS

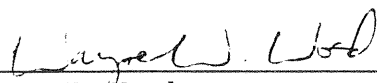
Page 2

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

00348-2 Method Blank
 00348-3 Accuracy (% Recovery)
 00348-4 Precision (% RPD)
 00348-5 Date Extracted
 00348-6 Date Analyzed

PARAMETER	00348-2	00348-3	00348-4	00348-5	00348-6
Chlorinated Hydrocarbon					
Pesticides (508)					
Endrin, ug/l	<0.020	94 %	1.1 %	02.05.93	02.09.93
Gamma-BHC, ug/l	<0.010	80 %	3.8 %	02.05.93	02.09.93
Methoxychlor, ug/l	<0.50	---	---	02.05.93	02.09.93
Toxaphene, ug/l	<1.0	---	---	02.05.93	02.09.93
Chlorophenoxy Acid Herbicides (515.1)					
2,4-D, ug/l	<0.50	118 %	5.1 %	02.05.93	02.08.93
2,4,5-TP Silvex, ug/l	<0.50	88 %	10 %	02.05.93	02.08.93

Method: EPA 40 CFR Part 136
 HRS Certification #'s: 81291, 87279, E81005, E87052



 Wayne W. Word

000015



Environmental
Science &
Engineering, Inc.

February 24, 1993
ESE No.: 3924039V L201 3200

Mr. Don Hash
CH2M Hill
POB 370
Alachua, FL 32615

RE: ESE Sample IDs: CHZRAD93*2
CH2M Hill Pr. #: GN01252; PO# 10212

Dear Mr. Hash:

Enclosed is the result of analysis of 1 water sample sent to ESE for selected radionuclides evaluation. The sample was collected on January 29, 1993 and received at ESE on February 5, 1993. A copy of the Chain-of-Custody form is enclosed also as requested.

The sample was analyzed in accordance with procedures specified in **Prescribed Procedures for Measurement of Radioactivity in Drinking Water**, EPA-600-4-80-03 1980, as applicable to the parameters of interest. Our laboratory is certified to perform analysis by the Florida DER/DHRS (certification nos. 82138 and E82067).

Your cost for this analysis is \$30.00 as previously agreed (reference PO Lab 10212). An itemized invoice in this amount will follow shortly; payment is requested within 30 days of the invoice date.

Thank you for giving ESE this opportunity to be of service. Please feel free to call me if you have any questions or need additional assistance.

Sincerely,

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

Barbara J. Ritter
Project Manager

Enclosure

000016

PROJECT NUMBER 7934025 0201
 FIELD GROUP CH2RAD93

PROJECT NAME CH2MHILL - RADS
 PROJECT MANAGER B.J. RITTER

RESULTS OF ANALYSIS

SAMPLE ID'S GN-01252-001
 PARAMETERS STORET CH2RAD93
 UNITS METHOD 2
 DATE 01/29/93
 TIME
 ALPHA,GROSS 1501 109
 PC/L R
 ALPHA,GR.,CT.ERROR 1502 221
 +/-PC/L R

BATCH : G35499
 CLASSIFICATION : GROSS ALPHA- EPA 900

QC TYPE : FDER/SW REPORT DATE/TIME : 02/24/93 16:27:25
 ANALYST : SANDRA MIHOCIK ANALYSIS DATE : 02/23/93
 TRACTOR : EXTRACT DATE :
 DATA ENTRY : SANDRA MIHOCIK

STATUS : FINAL

METHOD BLANK CORRECTION METHOD : NONE

FIELD GRP	QC TYPE	PROJECT NUMBER	PROJECT NAME	LAB COORDINATOR
CH2RAD93	FDER	7934025 0201	CH2MHILL - RADS	BARBARA RITTER

BATCH : G35499

Method Blank Sample Summary

DATE	SAMPLE	STORET	PARAMETER	UNITS	FOUND
02/23/93	MB*NONE*1	1501*R	ALPHA,GROSS	PC/L	ND
02/23/93	MB*NONE*1	1502*R	ALPHA,GR.,CT.ERROR	+/-PC/L	0.7
02/23/93	MB*NONE*1	3501*R	BETA,GROSS	PC/L	ND
02/23/93	MB*NONE*1	3502*R	BETA,GR.,CT.ERROR	+/-PC/L	1.9

Duplicate Analysis Sample Summary

DATE	SAMPLE	STORET	PARAMETER	UNITS	REP #1	REP #2	RPD	RPD CRIT
02/23/93	RP*OTHER *11	1501*R	ALPHA,GROSS	PC/L	<1.0	<1.0	0.0	51
02/23/93	RP*OTHER *11	3501*R	BETA,GROSS	PC/L	10.3	16.0	43.3	49

Standard Matrix Spike Recovery Summary

DATE	SAMPLE	STORET	PARAMETER	%RECV	RECV CRIT	UNITS	TARGET	FOUND
02/23/93	SP*NONE*1	1501*R	ALPHA,GROSS	108.7	74-122	PC/L	42.6	46.3
02/23/93	SP*NONE*1	3501*R	BETA,GROSS	103.8	58-130	PC/L	106	110

Sample Matrix Spike Recovery Summary

DATE	SAMPLE	STORET	PARAMETER	%RECV	RECV CRIT	UNSPIKED	UNITS	TARGET	FOUND	RPD
02/23/93	SPM1*OTHER *11	1501*R	ALPHA,GROSS	119.6	74-122	0.0	PC/L	179	214	
02/23/93	SPM1*OTHER *11	3501*R	BETA,GROSS	105.4	58-130	10.3	PC/L	426	449	
02/23/93	SPM2*OTHER *11	1501*R	ALPHA,GROSS	112.1	74-122	0.0	PC/L	182	204	6.4
02/23/93	SPM2*OTHER *11	3501*R	BETA,GROSS	112.4	58-130	10.3	PC/L	427	480	6.5

CH2M HILL Project # SE519415.44.33		Purchase Order #		LAB TEST CODES				SHADED AREA -- FOR LAB USE ONLY							
Project Name F.R.A.B. - State Esq. A.S.R.				# OF CONTAINERS	ANALYSES REQUESTED GROSS ALPHA GROSS BETA GROSS GAMMA PEST / HERBS				Lab 1 # GN-01252		Lab 2 #				
Company Name/CH2M HILL Office									Quote #		Kit Request #				
Project Manager & Phone # Mr. [] Ms. [] ALBERT MURIZ / D+B Dr. []		Report Copy to: SEAN SKEHAN / D+B			Project #				No. of Samples 1		Page 1	of 1			
Requested Completion Date: 2/19/2000		Sampling Requirements SDWA NPDES RCRA OTHER <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>							Sample Disposal: Dispose <input checked="" type="checkbox"/> Return <input type="checkbox"/>		COC Rev		Login Belt 2/2	LIMS Ver 1/24 2/2	Ack Gen
Sampling		Type COM P		Matrix WATER SOIL		CLIENT SAMPLE ID (9 CHARACTERS)				REMARKS		LAB 1 ID	LAB 2 ID		
Date 29 JAN		Time		X X		Blk				2		Travel Blk		002	
Sampled By & Title MICHAEL E. PEIERA				Date/Time		Relinquished By MICHAEL E. PEIERA				Date/Time		HAZWRAP/NESSA: Y (N)			
Received By Don Hall				Date/Time 20 JAN 12:00		Relinquished By Fred Reeves				Date/Time 2/14/03 16:45		QC Level: 0 2 3 Other: _____			
Received By				Date/Time		Relinquished By				Date/Time		COC Rec Y ICE Y			
Received By				Date/Time		Shipped Via UPS BUS Fed-Ex Hand Other				Date/Time		Ana Req N TEMP 3°C			
Work Authorized By				Date/Time		Shipping # 4847833104				Cust Seal Y Ph					
Remarks															

Instructions and Agreement Provisions on Reverse Side

CH2M HILL Project # 555199154133 Purchase Order #

Project Name F.K.A. - STONE ISLAND A.S.R

Company Name/CH2M HILL Office

Project Manager & Phone # Mr. [] Ms. [] Dr. [] ALAN MUNIZ / DEB Report Copy to: SEAN SKELAN / DEB SAME

Requested Completion Date: 7/1/93 Sampling Requirements: SDWA NPDES RCRA OTHER Sample Disposal: Dispose Return

Sampling Type Matrix: COM, GRA, WATER, SOIL. CLIENT SAMPLE ID (9 CHARACTERS)

Table with columns for Date, Time, Type, Matrix, and Client Sample ID. Row 1: 29 JAN, X, X, Blk.

LAB TEST CODES table with handwritten entries: GRSA, PES, HES.

ANALYSES REQUESTED: METALS, GROSS ALPHA, GROSS BETA, PEST/HERBS.

CONTAINERS: 2 Travel Blks. G00321E. REMARKS: TO NANCY MOSERICK 2/16/93.

SHADED AREA -- FOR LAB USE ONLY. Lab 1 # GN-01252 Lab 2 #

Quote # Kit Request #

Project #

No. of Samples Page of

COC Rev Login LIMS Ver Ack Gen

REMARKS LAB 1 ID LAB 2 ID

Sampled By & Title: MICHAEL E. PEIER Date/Time

Received By: [Signature] Date/Time: 30 JAN 1200

Received By: V. Prem Des ESE Date/Time: 2-5-93 1700

Received By: (Please sign and print name) Date/Time

Work Authorized By (Please sign and print name) Remarks

Relinquished By: MICHAEL E. PEIER Date/Time

Relinquished By: (Please sign and print name) Date/Time

Relinquished By: (Please sign and print name) Date/Time

Shipped Via: Fed-Ex Hand Other

HAZWRAP/NESSA: Y N

QC Level: 1 2 3 Other:

COC Rec: Y ICE: Y

Temp Req: N TEMP: 3°C Ph:

Shipping # 4847833104

CH2M HILL Project # SE1149154133 Purchase Order #

Project Name F.R. 4A - Spine Island A.S.R.

Company Name/CH2M HILL Office

Project Manager & Phone # ALBERT MUNIZ / DFB Report Copy to: SEAN SKELAN / DFB Ms. JAMES

Requested Completion Date: 2/17/93 Sampling Requirements: SDWA NPDES RCRA OTHER Sample Disposal: Dispose Return

Sampling Type Matrix: C O M P G R A B W A T E R S O I L CLIENT SAMPLE ID (9 CHARACTERS)

Table with columns for Date, Time, Type, Matrix, and Client Sample ID. Row 1: 29 JAN, X, X, Blk, 2 Travel Blk

LAB TEST CODES table with handwritten entries: GRSA, PES, HES

SHADED AREA -- FOR LAB USE ONLY. Lab 1 # GN-01252, Lab 2 #, Quote #, Kit Request #

ANALYSES REQUESTED: METALS, GROSS ALPHA, GROSS BETA, PEST/HERBS

Project #, No. of Samples, Page, of, COC Rev, Login, LIMS Ver, Ack Gen, REMARKS, LAB 1 ID, LAB 2 ID

Sampled By & Title: MICHAEL E. PEIER

Date/Time

Relinquished By: MICHAEL E. PEIER

Date/Time

HAZWRAP/NESSA: Y N

Received By: [Signature]

Date/Time: 2/15/93 1200

Relinquished By: [Signature]

Date/Time: 2/14/93 1645

QC Level: 2 3 Other: _____

Received By: [Signature]

Date/Time

Relinquished By: _____

Date/Time

COC Rec ICE Ana Req TEMP 3°C Cust Seal Ph

Received By: DALE SPEARS

Date/Time: 2/15/93 0830

Shipped Via: UPS BUS Fed-Ex Hand Other

Shipping # 4847833104

Work Authorized By: _____

Remarks: T300348