

CARNAHAN BAYOU AQUIFER SUMMARY  
BASELINE MONITORING PROGRAM, FY 2004

APPENDIX 7  
OF THE  
TRIENNIAL SUMMARY REPORT  
FOR THE  
WATER QUALITY ASSESSMENT DIVISION  
OF  
LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

PARTIAL FUNDING PROVIDED THROUGH THE CWA

## CARNAHAN BAYOU AQUIFER SUMMARY

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## **BACKGROUND**

In order to better assess the water quality of a particular aquifer at a given point in time, an attempt was made during the year to sample all wells producing from a common aquifer in a narrow time frame. Also, to more conveniently and economically promulgate those data collected from a particular aquifer, a summary report on each aquifer sampled was prepared separately. Collectively, these aquifer summaries will make up the Triennial Summary Report.

Figure 7-1 shows the geographic locations of the Carnahan Bayou aquifer and the associated wells, whereas Table 7-2 lists the wells in the aquifer along with their total depths and the use made of produced waters and date sampled.

These data show that in April and May of 2004, twelve wells were sampled which produce from the Carnahan Bayou aquifer. Six of the twelve wells are classified as public supply, four are classified as domestic wells, one is classified as an industrial use well and the one remaining well is used in power generation. The wells are located in five parishes across the central area of the state.

Well data for registered water wells were obtained from the Louisiana Department of Transportation and Development's Water Well Registration Data file.

## **GEOLOGY**

The Carnahan Bayou member consists of sands, silts, and clays, with some gravel. The Carnahan Bayou member, along with the Williamson Creek and Dough Hills, is grouped into the Jasper aquifer. The aquifer unit consists of fine to coarse sand, which may grade laterally and vertically to silt and clay.

## **HYDROGEOLOGY**

Recharge takes place primarily as a result of the direct infiltration of rainfall in interstream, upland outcrop areas, movement of water through overlying terrace deposits, and leakage from other aquifers. The hydraulic conductivity of the Carnahan Bayou varies between 20-260 feet/day.

The maximum depths of occurrence of freshwater in the Carnahan Bayou range from 250 feet above sea level, to 3,300 feet below sea level. The range of thickness of the fresh water interval in the Carnahan Bayou is 100 to 1,100 feet. The depths of the Carnahan Bayou wells that were monitored in conjunction with the BMP range from 66 to 2,036 feet.

## INTERPRETATION OF DATA

### FIELD, WATER QUALITY, AND NUTRIENTS PARAMETERS

Table 7-3 lists the field parameters that are checked and the water quality and nutrients parameters that are sampled for at each well. It also shows the field results and the water quality and nutrients data results for each well. Table 7-4 provides an overview of field data, water quality data, and nutrients data for the Carnahan Bayou aquifer, listing the minimum, maximum, and average results for these parameters.

#### **Federal Primary Drinking Water Standards**

Under the Federal Safe Drinking Water Act, EPA has established maximum contaminant levels (MCLs) for pollutants that may pose a health risk in public drinking water. An MCL is the highest level of a contaminant that EPA allows in public drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. While not all wells sampled were public supply wells, this Office does use the MCLs as a benchmark for further evaluation.

A review of the analyses listed in Table 7-3 shows that no primary MCL was exceeded for field, water quality, or nutrients parameters.

#### **Federal Secondary Drinking Water Standards**

EPA has set secondary standards that are defined as non-enforceable taste, odor, or appearance guidelines. Field and laboratory data contained in Table 7-3 show that the following secondary MCLs (SMCLs) were exceeded:

PH – SMCL = 6.5 – 8.5 Standard Units (SU)

V-566 – 6.30 SU

V-8102Z – 5.58 SU

Total Dissolved Solids (TDS) – SMCL = 500 parts per million (ppm)

G5196Z – 670 ppm

R-1210 – 712 ppm

Color – SMCL = 15 Platinum-Cobalt Units (PCU)

CO-47 – 50 PCU

#### **Comparison to Historical Data**

Table 7-5 lists the current field, water quality, and nutrients data averages alongside those parameters' data averages for the three previous sampling rotations (three, six, and nine years prior). A comparison of these averages show that pH and TKN have increased, while all other parameters have remained fairly constant with minor fluctuations.

## INORGANIC PARAMETERS

The inorganic (metals) parameters were analyzed by a contract lab for this aquifer due to the LDEQ metals lab being unavailable. Initial results from the contract lab indicated that several wells had increased concentrations of inorganics when compared to previous sampling. However, upon more careful review of this data in comparison with historical and subsequent sampling results reveals that much of the contract lab's reported values were too inconsistent to be considered valid. Therefore, all inorganic results for this aquifer have been rejected, and are not used in the production of Carnahan Bayou Aquifer Summary.

### **Federal Primary Drinking Water Standards**

No determination can be made due to the inorganic laboratory results being rejected.

### **Federal Secondary Drinking Water Standards**

No determination can be made due to the inorganic laboratory results being rejected.

### **Comparison to Historical Data**

No comparison can be made due to the inorganic laboratory results being rejected.

## VOLATILE ORGANIC COMPOUNDS

Table 7-6 shows the volatile organic compounds (VOCs) target analyte list. Due to the large number of analytes in this category, a total list of the analytical results for each analyte is not provided, however any detection of a VOC would be discussed in this section.

No VOCS were detected during the 2004 sampling of the Carnahan Bayou aquifer.

## SEMIVOLATILE ORGANIC COMPOUNDS

Table 7-7 shows the semivolatile organic compounds (SVOCs) target analyte list. Due to the large number of analytes in this category, a total list of the analytical results for each analyte is not provided, however any detection of an SVOC would be discussed in this section.

There were no confirmed detections of SVOCs during the 2004 sampling of the Carnahan Bayou aquifer.

## PESTICIDES AND PCBS

Table 7-8 shows the pesticides and PCBs target analyte list. Due to the large number of analytes in this category, a total list of the analytical results for each analyte is not provided, however any detection of a pesticide or PCB would be discussed in this section.

No Pesticide or PCB was detected during the 2004 sampling of the Carnahan Bayou aquifer.

## COMMON WATER CHARACTERISTICS

Table 7-1 below highlights some of the more common water characteristics that are considered when studying ground water quality. The minimum, maximum, and average values that were found during the current sampling of the Carnahan Bayou aquifer for pH, TDS, hardness, chloride, and nitrite-nitrate are listed in the table. Figures 7-2 through 7-4 respectively, represent the contoured data for pH, TDS, and chloride. The data average for hardness shows that the ground water produced from this aquifer is in the soft to moderately hard range<sup>1</sup>.

**Table 7-1 Common Water Characteristics**  
Fiscal Year 2004

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
PH (SU)	5.58	8.40	7.57
TDS (ppm)	26	712	302.8
Hardness (ppm)	<5	313	66.9
Chloride (ppm)	3.2	206	27.1
Nitrite-Nitrate (ppm)	<0.05	0.25	0.06

<sup>1</sup> Classification based on hardness scale from: *Peavy, H. S. et al. Environmental Engineering, 1985.*

## **SUMMARY AND RECOMMENDATIONS**

In summary, valid analytical and field data show that the ground water produced from this aquifer is in the soft to moderately hard range, and is of good quality when considering short or long-term health risk guidelines. Laboratory data show that no well that was sampled during the Fiscal Year 2004 monitoring of the Carnahan Bayou aquifer exceeded a primary MCL. The data also show that this aquifer is of good quality when considering taste, odor, or appearance guidelines. A comparison to historical BMP data show that while there were some general fluctuations, the characteristics of the ground water produced from the Carnahan Bayou aquifer has not changed significantly since the FY 1995 sampling.

The statement of quality for Carnahan Bayou aquifer does not consider the inorganic (metals) data for the FY 2004 sampling of this aquifer. The validity of the analytical data was questionable and reported values were inconsistent with historical and subsequent sample results. Therefore, it is important to remember that the quality assessment for this aquifer for this time period does not consider inorganic parameters.

It is recommended that the wells assigned to the Carnahan Bayou aquifer be re-sampled as planned in approximately three years. Additionally, several wells should be added to the twelve currently in place to increase the well density for this aquifer.

Table 7-2 List of Wells Sampled

WELL NUMBER	PARISH	DATE SAMPLED	OWNER	DEPTH (FEET)	WELL USE
BE-405	BEAUREGARD	4/19/2004	BOISE CASCADE	1016	INDUSTRIAL
CO-47	CONCORDIA	5/4/2004	CITY OF VIDALIA	310	PUBLIC SUPPLY
CO-71	CONCORDIA	4/20/2004	CONCORDIA W.W. DIST. NO.1	305	PUBLIC SUPPLY
G-5061Z	GRANT	4/20/2004	PRIVATE OWNER	275	DOMESTIC
G-5196Z	GRANT	5/4/2004	PRIVATE OWNER	125	DOMESTIC
R-1001	RAPIDES	4/20/2004	GARDENER WATER SYSTEM	1080	PUBLIC SUPPLY
R-1172	RAPIDES	5/4/2004	CLECO-RODEMACHER	298	POWER GENERATION
R-1210	RAPIDES	4/20/2004	CITY OF ALEXANDRIA	2036	PUBLIC SUPPLY
R-FAIRCLOT	RAPIDES	4/20/2004	PRIVATE OWNER	270	DOMESTIC
V-496	VERNON	4/19/2004	U.S. ARMY/FORT POLK	1415	PUBLIC SUPPLY
V-566	VERNON	4/19/2004	ALCO-HUTTON VFD	143	PUBLIC SUPPLY
V-8102Z	VERNON	4/19/2004	PRIVATE OWNER	66	DOMESTIC

Table 7-3 Summary Water Quality Parameters

Well Name	pH SU	Sal. ppt	Sp. Cond. mmhos/cm	TDS g/L	Temp. Deg. C	Alk. mg/L	NH3 mg/L	Cl mg/L	Color PCU	Hard. mg/L	Nitrite-Nitrate (as N) mg/L	TKN mg/L	Tot. P mg/L	Sp. Cond. umhos/cm	SO4 mg/L	TDS mg/L	TSS mg/L	Turb. NTU
	LABORATORY DETECTION LIMITS →					2.0	0.1	1.3	5.0	5.0	0.05	0.1	0.05	10	1.3	4.0	4.0	1.0
	FIELD PARAMETERS					LABORATORY PARAMETERS												
BE-405	8.40	0.18	0.37	0.24	26.81	185	0.26	6.5	<5	24.4	<0.05	0.48	0.06	363	8.5	268	<4	<1
BE-405*	8.40	0.18	0.37	0.24	26.81	184	0.26	6.4	<5	24.3	<0.05	0.37	0.07	367	8.7	215	<4	<1
CO-47	7.05	0.30	0.61	0.40	18.77	244	0.86	34.6	50	196	0.25	0.91	0.11	603	29	352	<4	5.1
CO-71	7.13	0.35	0.71	0.46	20.30	360	0.75	8	<5	313	<0.05	0.97	0.77	702	30.9	440	14.5	29
G-5061Z	8.05	0.14	0.28	0.18	22.20	150	0.31	4.2	<5	5.6	<0.05	0.52	0.21	286	<1.3	202	<4	1.3
G-5196Z	7.24	0.53	1.05	0.68	19.37	538	1.1	26.4	15	216	<0.05	1.12	<0.05	1027	7.9	670	<4	15
R-1001	8.23	0.21	0.43	0.28	27.64	209	0.37	10	<5	<5	<0.05	0.41	0.37	423	14.2	288	<4	<1
R-1172	7.91	0.16	0.33	0.21	21.90	129	0.39	13.4	<5	6.5	<0.05	0.78	0.2	321	23.1	226	<4	<1
R-1172*	7.91	0.16	0.33	0.21	21.90	130	0.38	13.4	<5	6.5	<0.05	0.84	0.26	321	23.1	220	<4	<1
R-1210	8.08	0.63	1.29	0.84	35.51	314	0.51	206	<5	5.5	0.06	0.92	0.44	1253	<1.3	712	<4	<1
R-FAIRCLOT	8.08	0.15	0.31	0.20	20.69	145	<0.1	10.4	<5	<5	0.08	0.28	0.44	310	7.2	209	7	3.3
V-496	7.67	0.19	0.4	0.26	29.32	179	0.54	18.9	<5	101	<0.05	0.77	0.07	397	6.7	222	<4	1.4
V-566	6.30	0.09	0.19	0.12	20.95	54.9	0.17	17.4	<5	27.7	<0.05	0.41	0.57	194	13	189	<4	<1
V-8102Z	5.58	0.01	0.03	0.01	20.42	5.4	<0.1	3.2	<5	5.4	0.15	<0.1	0.07	25.7	<1.3	26	<4	1.2

\* Denotes duplicate sample.

**Table 7-4 Water Quality Statistics**  
Fiscal Year 2004

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	Temperature (°C)	18.77	35.51	23.76
	pH (SU)	5.58	8.4	7.57
	Specific Conductance (mmhos/cm)	0.03	1.29	0.48
	Salinity (ppt)	0.01	0.63	0.23
	TDS (g/L)	0.01	0.84	0.31
LABORATORY	Alkalinity (ppm)	5.4	538	201.95
	Chloride (ppm)	3.2	206	27.06
	Color (PCU)	<5	50	6.79
	Specific Conductance (umhos/cm)	25.7	1253	470.91
	Sulfate (ppm)	<1.3	30.9	12.45
	TDS (ppm)	26	712	302.79
	TSS ( ppm )	<4	14.5	<4
	Turbidity (NTU)	<1	29	4.27
	Ammonia, as N (ppm)	<0.1	1.1	0.43
	Hardness (ppm)	<5	313	66.92
	Nitrate - Nitrite, as N (ppm)	<0.05	0.25	0.06
	TKN (ppm)	<0.1	1.12	0.63
	Total Phosphorous (ppm)	<0.05	0.77	0.25

**Table 7-5 Three-year Water Quality Statistics**  
Fiscal Year 2004

PARAMETER		FY 1995 AVERAGE	FY 1998 AVERAGE	FY 2001 AVERAGE	FY 2004 AVERAGE
FIELD	PH (SU)	6.90	7.11	7.66	7.57
	Temperature °C	27.54	24.53	23.58	23.76
	Sp. Conductance (mmhos/cm)	0.468	0.389	0.346	0.480
	Salinity (ppt)	0.21	0.19	0.17	.23
LABORATORY	TSS (ppm)	5.1	<4	<4	<4
	TDS (ppm)	326.9	246.7	325.7	302.8
	Alkalinity (ppm)	202.7	186.3	175.6	201.9
	Hardness (ppm)	62.7	70.1	48.0	66.9
	Turbidity (NTU)	4.79	11.57	5.81	4.27
	Sp. Conductance (umhos/cm)	492.3	405.5	443.0	470.9
	Color (PCU)	16.4	9.2	5.3	6.8
	Chloride (ppm)	41.5	13.0	33.9	27.1
	Sulfate (ppm)	12.77	10.22	8.64	12.45
	Nitrite-Nitrate, as N (ppm)	<0.05	0.11	<0.05	0.06
	Phosphorus (ppm)	0.27	0.33	0.36	0.25
	TKN (ppm)	0.29	0.65	0.50	0.63
	Ammonia (ppm)	0.41	0.38	0.32	0.43

**Table 7-6 List of VOC Analytical Parameters**

BASELINE MONITORING PROGRAM  
VOLATILE ORGANICS BY EPA METHOD 624

COMPOUND	DETECTION LIMIT (ppb)
1,1-DICHLOROETHANE	2
1,1-DICHLOROETHENE	2
1,1,1-TRICHLOROETHANE	2
1,1,2-TRICHLOROETHANE	2
1,1,2,2-TETRACHLOROETHANE	2
1,2-DICHLOROBENZENE	2
1,2-DICHLOROETHANE	2
1,2-DICHLOROPROPANE	2
1,3-DICHLOROBENZENE	2
1,4-DICHLOROBENZENE	2
BENZENE	2
BROMOFORM	2
CARBON TETRACHLORIDE	2
CHLOROBENZENE	2
DIBROMOCHLOROMETHANE	2
CHLOROETHANE	2
TRANS-1,2-DICHLOROETHENE	2
CIS-1,3-DICHLOROPROPENE	2
BROMODICHLOROMETHANE	2
METHYLENE CHLORIDE	2
ETHYLBENZENE	2
BROMOMETHANE	2
CHLOROMETHANE	2
METHYLENE CHLORIDE	2
O-XYLENE	2
STYRENE	2
METHYL-t-BUTYL ETHER	2
TETRACHLOROETHENE	2
TOLUENE	2
TRANS-1,3-DICHLOROPROPENE	2
TRICHLOROETHENE	2
TRICHLOROFLUOROMETHANE	2
CHLOROFORM	2
VINYL CHLORIDE	2

**Table 7-7 List of Semi-volatile Analytical Parameters**

BASELINE MONITORING PROGRAM  
SEMIVOLATILE ORGANICS BY EPA METHOD 625

COMPOUND	DETECTION LIMIT (ppb)
1,2-Dichlorobenzene	10
1,2,3-Trichlorobenzene	10
1,2,3,4-Tetrachlorobenzene	10
1,2,4-Trichlorobenzene	10
1,2,4,5-Tetrachlorobenzene	10
1,3-Dichlorobenzene	10
1,3,5-Trichlorobenzene	10
1,4-Dichlorobenzene	10
2-Chloronaphthalene	10
2-Chlorophenol	20
2-Methyl-4,6-dinitrophenol	20
2-Nitrophenol	20
2,4-Dichlorophenol	20
2,4-Dimethylphenol	20
2,4-Dinitrophenol	20
2,4-Dinitrotoluene	10
2,4,6-Trichlorophenol	20
2,6-Dinitrotoluene	10
3,3'-Dichlorobenzidine	10
4-Bromophenyl phenyl ether	10
4-Chloro-3-methylphenol	20
4-Chlorophenyl phenyl ether	10
4-Nitrophenol	20
Acenaphthene	10
Acenaphthylene	10
Anthracene	10
Benzidine	20
Benzo[a]pyrene	10
Benzo[k]fluoranthene	10
Benzo[a]anthracene	10
Benzo[b]fluoranthene	10
Benzo[g,h,i]perylene	10
Bis(2-chloroethoxy)methane	10
Bis(2-ethylhexyl)phthalate	10
Bis(2-chloroethyl)ether	10
Bis(2-chloroethyl)ether	10
Bis(2-chloroisopropyl)ether	10
Butylbenzylphthalate	10
Chrysene	10

**Table 7-7 (Cont'd)**  
Semivolatile Parameters

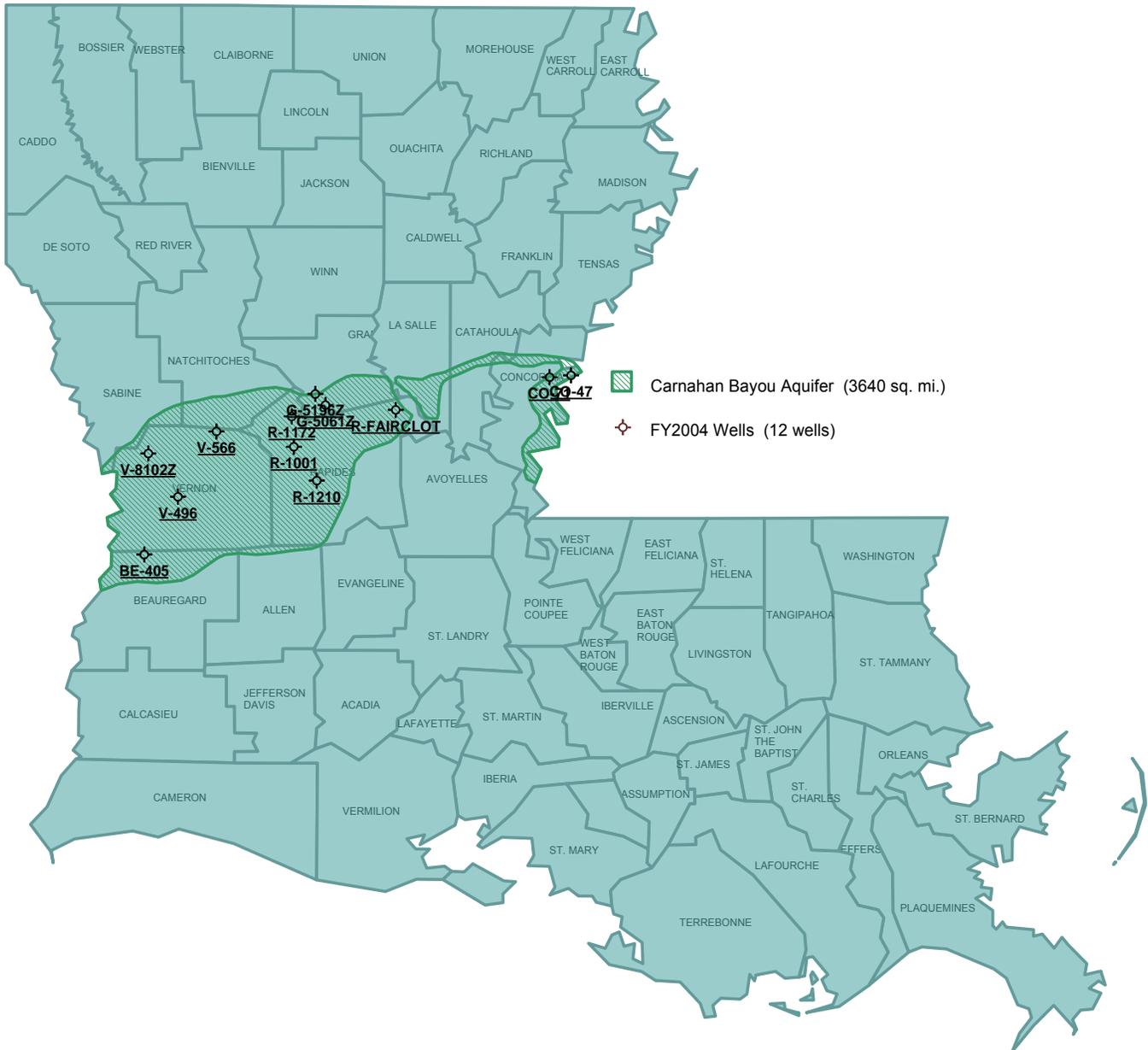
<b>COMPOUND</b>	<b>DETECTION LIMIT (ppb)</b>
Dibenzo[a,h]anthracene	10
Diethylphthalate	10
Dimethylphthalate	10
Di-n-butylphthalate	10
Di-n-octylphthalate	10
Fluoranthene	10
Fluorene	10
Hexachlorobenzene	10
Hexachlorobutadiene	10
Hexachlorocyclopentadiene	10
Hexachloroethane	10
Indeno[1,2,3-cd]pyrene	10
Isophorone	10
Naphthalene	10
Nitrobenzene	10
N-Nitrosodimethylamine	10
N-Nitrosodiphenylamine	10
N-nitroso-di-n-propylamine	10
Pentachlorobenzene	10
Pentachlorophenol	20
Phenanthrene	10
Phenol	20
Pyrene	10

**Table 7-8 List of Pesticide and PCB Analytical Parameters**

BASELINE MONITORING PROGRAM  
SEMIVOLATILE ORGANICS BY EPA METHOD 625

COMPOUND	DETECTION LIMIT (ppb)
4,4'-DDD	2
4,4'-DDE	2
4,4'-DDT	2
Aldrin	2
alpha-BHC	2
beta-BHC	2
delta-BHC	2
gamma-BHC (Lindane)	2
Chlordane	2
Dieldrin	2
Endosulfan I	2
Endosulfan II	2
Endosulfan sulfate	2
Endrin	2
Endrin aldehyde	2
Heptachlor	2
Heptachlor epoxide	2
Toxaphene	75
Aroclor-1016	10
Aroclor-1221	10
Aroclor-1232	10
Aroclor-1242	10
Aroclor-1248	10
Aroclor-1254	10
Aroclor-1260	10

## BASELINE MONITORING PROGRAM WELLS OF THE CARNAHAN BAYOU AQUIFER



Aquifer boundary digitized from Louisiana Hydrologic Map No. 2: Areal Extent of Freshwater in Major Aquifers of Louisiana, Smoot, 1986; USGS/LDOTD Report 86-4150.

**Figure 7-1 Location Plat, Carnahan Bayou Aquifer**

# CARNAHAN BAYOU AQUIFER - pH (SU)

## Baseline Monitoring Progm, FY2004

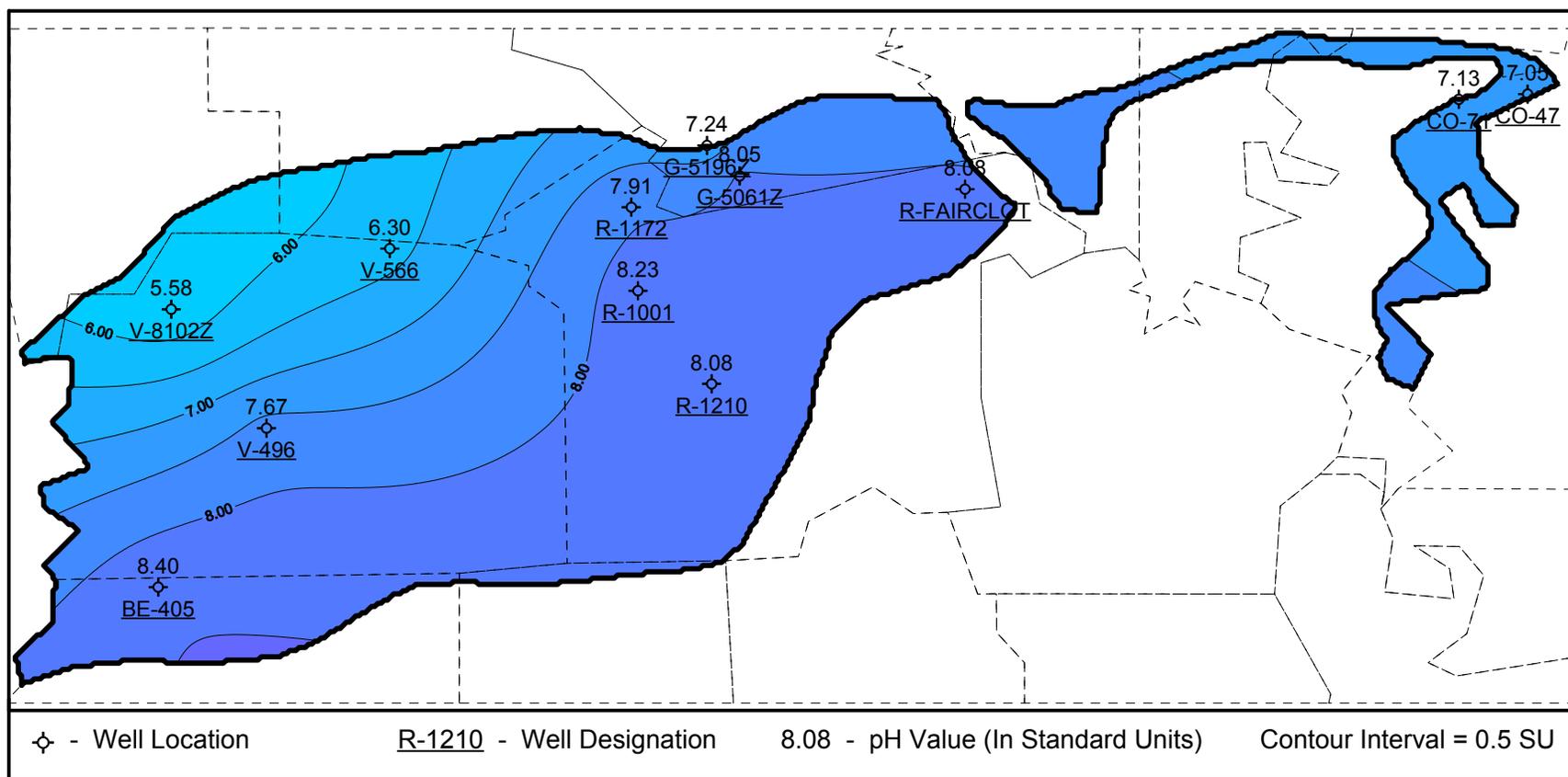


Figure 7-2 Map of pH Data

# CARNAHAN BAYOU AQUIFER - TDS (ppm)

Baseline Monitoring Progrm, FY2004

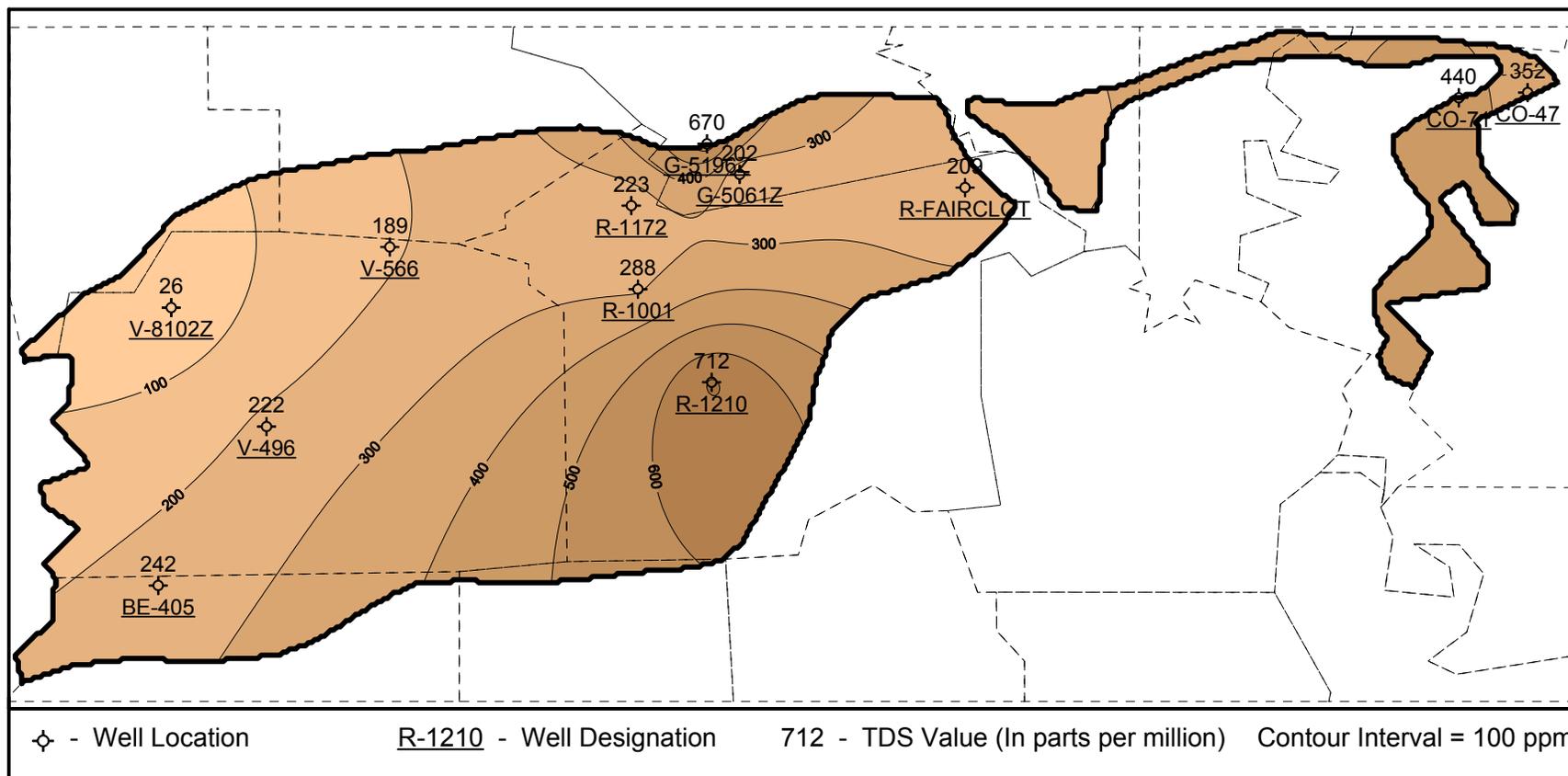


Figure 7-3 Map of TDS Data

# CARNAHAN BAYOU AQUIFER - Chloride (ppm)

Baseline Monitoring Progm, FY2004

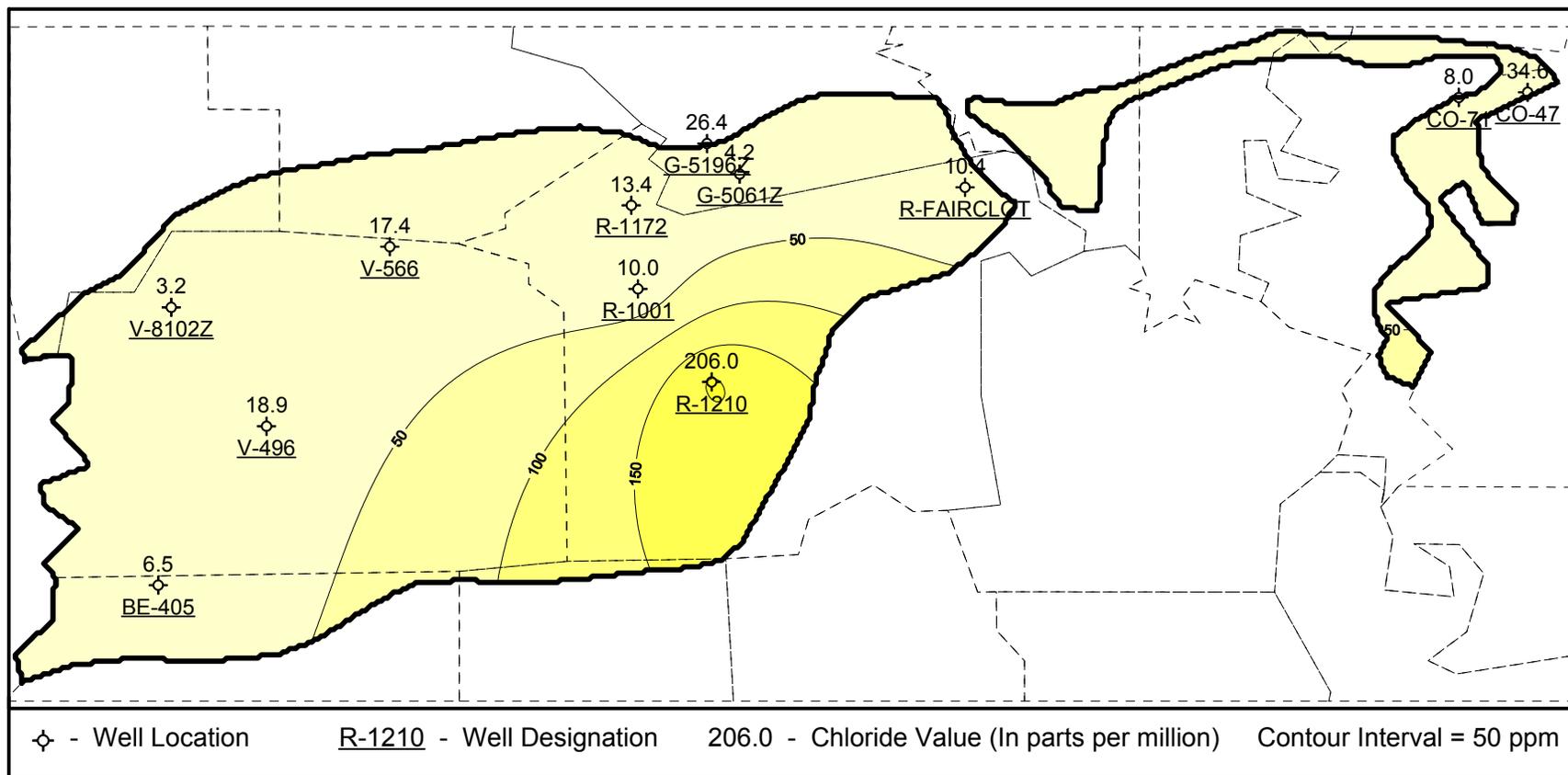


Figure 7-4 Map of Chloride Data