CATAHOULA AQUIFER SUMMARY

BASELINE MONITORING PROGRAM, FY 2004

APPENDIX 5

OF THE

TRIENNIAL SUMMARY REPORT, 2006

FOR THE

WATER QUALITY ASSESSMENT DIVISION

OF

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

PARTIAL FUNDING PROVIDED THROUGH CWA

CATAHOULA 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 current sampling cycle to sample all assigned 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 Baseline Monitoring Program Triennial Summary Report for 2006.

Figure 5-1 shows the geographic locations of the Catahoula aquifer and the associated wells, whereas Table 5-1 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 February of 2004, four wells were sampled which produce from the Catahoula aquifer. All four wells are classified as public supply. The wells are located in four parishes in 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 Catahoula Formation consists primarily of sands with some silty to sandy clays and overlies the regional confining clays of the Vicksburg and Jackson groups. Within the Catahoula, fine to coarse sands are discontinuous and interbedded with silt and clay.

HYDROGEOLOGY

Recharge takes place primarily as a result of the direct infiltration of rainfall in interstream, upland outcrop area, movement of water through overlying terrace deposits, and leakage from other aquifers. Saltwater ridges under the Red River and Little River valleys in central Louisiana divide the Catahoula aquifer. The hydraulic conductivity of the Catahoula varies between 20-260 feet/day.

The maximum depths of occurrence of freshwater in the Catahoula range from 250 feet above sea level, to 2,200 feet below sea level. The range of thickness of the fresh water interval in the Catahoula is 50 to 450 feet. The depths of the Catahoula wells that were monitored in conjunction with the BMP range from 188 to 1,477 feet.

PROGRAM PARAMETERS

The field parameters checked at each sampling site and the list of water quality analytical parameters are shown in Table 5-2. The inorganic (total metals) parameters analyzed in the laboratory are listed in Table 5-3. These tables also show the field and analytical results determined for each analyte.

In addition to the above mentioned water quality and inorganic analytical parameters, a list of target analytical parameters include three other categories of compounds: volatiles, semi-volatiles, and pesticides/PCB's. Due to the large number of analytes in these categories, tables were not prepared. A discussion of any detections from these three categories can be found in the following section. Also, in order for the reader to be aware of the total list of analytes, Tables 5-8, 5-9 and 5-10 were included in this report.

Tables 5-4 and 5-5 provide an overview of water quality and inorganic data for the Catahoula aquifer, listing the minimum, maximum, and average results for these parameters. Tables 5-6 and 5-7 compare these same parameter averages to historical Baseline Program-derived data for the Catahoula aquifer, from fiscal years 1995, 1998 and 2001.

Figures 5-2, 5-3, 5-4, and 5-5 respectively, represent the contoured data for pH, TDS, chloride and iron.

INTERPRETATION OF DATA

FIELD, WATER QUALITY, AND NUTRIENTS PARAMETERS

Federal Primary Drinking Water Standards: Under the Federal Safe Drining 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 this Office is not the regulating agency for drinking water standards, it does use the MCLs as a benchmark for further evaluation.

A review of the analyses listed in Table 5-2 shows that no primary MCL was exceeded for field, water quality, or nutrients parameters.

Those project wells reporting turbidity levels greater than 1.0 NTU, do not exceed the Primary MCL of 1.0, as this standard applies to surface water systems only.

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 5-2 show that no secondary MCL (SMCL) was exceeded.

INORGANIC PARAMETERS

Table 5-3 shows the inorganic (total metals) parameters that are sampled for and the analytical results for those parameters for each well. Table 5-5 provides an overview of inorganic data for the Catahoula aquifer, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards: A review of the analyses listed in Table 5-3 initially shows that no primary MCL was exceeded for total metals. However, it should be noted that the laboratory detection limits (DL) are higher than usual for these samples, some of which are above the respective analyte's MCL. This was due to a different laboratory being used to perform sample analyses. The affected total metals were: antimony (MCL = 6 ppb, DL = 60 ppb), beryllium (MCL = 4 ppb, DL = 5 ppb), selenium (MCL = 10 ppb, DL = 50 ppb) and thallium (MCL = 2 ppb, DL = 10 ppb). It cannot be stated absolutely that no MCL was exceeded in this category, however there were no detections reported for any of the total metals listed here.

Federal Secondary Drinking Water Standards: Laboratory data contained in Table 5-3 show that the following secondary MCL (SMCL) was exceeded:

Iron – SMCL = 300 ppm
G-295 – 520 ppm

VOLATILE ORGANIC COMPOUNDS

Table 5-8 shows the volatile organic compound (VOC) parameters that are sampled for. 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 VOC was detected during the 2004 sampling of the Catahoula aquifer.

SEMIVOLATILE ORGANIC COMPOUND

Table 5-9 show the semivolatile organic compound (SVOC) parameters that are sampled for. 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.

No SVOC was detected during the 2004 sampling of the Catahoula aquifer.

PESTICIDES AND PCBS

Table 5-10 shows the pesticide and PCB parameters that are sample for. 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 pesticides or PCBs were detected during the 2004 sampling of the Catahoula aquifer.

COMPARISON TO HISTORICAL DATA

Tables 5-6 and 5-7 list the current field, water quality, nutrients and inorganics (total metals) data averages alongside those parameters' data averages for the three previous sampling rotations (three, six and nine years prior). A comparison of these averages shows that while there are general fluctuations, the average concentrations of those parameters analyzed have remained fairly constant. It should be noted however, that due to the increased detection limit for the inorganic parameters for FY2004, an accurate comparison cannot be made. One notable difference though, is the consistent decrease in the average iron concentration since FY1995.

SUMMARY AND RECOMMENDATIONS

In summary, the data show that the ground water produced from this aquifer is soft[1], and is of good quality when considering short or long-term health risk guidelines. Laboratory data show that no BMP well that was sampled during the Fiscal Year 2004 monitoring of the Catahoula 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 are some general fluctuations, the characteristics of the ground water produced from the Catahoula aquifer has not changed significantly since the FY 1995 sampling.

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

[1] Classification based on hardness scale from: *Peavy, H. S. et al. Environmental Engineering, 1985.*

Table 5-1 Wells Sampled

WELL NUMBER	PARISH	DATE SAMPLED	OWNER	DEPTH (FEET)	WELL USE
CT-119	CATAHOULA	3/8/2004	CITY OF JONESVILLE	800	PUBLIC SUPPLY
G-295	GRANT	3/8/2004	POLLOCK AREA WATER SYSTEM	188	PUBLIC SUPPLY
LS-278	LA SALLE	3/8/2004	ROGERS WATER SYSTEM	352	PUBLIC SUPPLY
V-656	VERNON	3/8/2004	EAST CENTRAL VERNON WATER SYS.	1,477	PUBLIC SUPPLY

Table 5-2 Field, Water Quality, and Nutrients Data

WELL NAME	PH SU	SAL. PPT	SP. COND. MMHOS/CM	TDS G/L	TEMP. DEG. C	ALK. PPM	NH3 PPM	CL PPM	COLOR PCU	HARD PPM	NITRITE-NITRATE (AS N) PPM	TKN PPM	TOT. P PPM	SP. COND. UMHOS/CM	SO4 PPM	TDS PPM	TSS PPM	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												
CT-119	7.38	0.09	0.191	0.12	23.30	117	0.31	20.2	<5	<5	<0.05	0.49	0.3	303	12.4	193	<4	<1
CT-119*	7.38	0.09	0.191	0.12	23.30	117	0.27	20.4	<5	<5	<0.05	0.33	0.39	304	12.5	193	<4	<1
G-295	7.84	0.16	0.327	0.21	19.68	174	0.33	11.2	10	<5	<0.05	0.58	1.1	352	<1.25	264	<4	5.4
LS-278	7.19	0.10	0.208	0.14	21.16	99	0.18	3.4	<5	<5	<0.05	0.25	0.39	202	5	139	<4	<1
V-656	8.15	0.15	0.316	0.21	29.85	152	0.26	8.8	10	<5	<0.05	0.39	0.57	303	<1.25	185	<4	<1

Table 5-3 Inorganic Data

WELL NAME	Antimony PPB	Arsenic PPB	Barium PPB	Beryllium PPB	Cadmium PPB	Chromium PPB	Copper PPB	Iron PPB	Lead PPB	Mercury PPB	Nickel PPB	Selenium PPB	Thallium PPB	Zinc PPB
Laboratory Detection Limits	60	10	200	5	5	10	10	100	3	0.2	40	10	10	20
CT-119	<60	<10	<200	<5	<5	<10	<10	246	<3	<0.2	<40	<10	<10	<20
CT-119*	<60	<10	<200	<5	<5	<10	<10	251	3.32	<0.2	<40	<10	<10	<20
G-295	<60	<10	<200	<5	<5	<10	<10	520	6.91	<0.2	<40	<10	<10	33.4
LS-278	<60	<10	<200	<5	<5	<10	<10	273	<3	<0.2	<40	<10	<10	<20
V-656	<60	<10	<200	<5	<5	<10	<10	<100	<3	<0.2	<40	<10	<10	<20

* Denotes duplicate sample.

Table 5-4 Field, Water Quality and Nutrients Statistics

Fiscal Year 2004

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	Temperature °C	19.68	29.85	23.46
	pH (SU)	7.19	8.15	7.59
	Sp. Conductance (mmhos/cm)	0.191	0.327	0.25
	Salinity (ppt)	0.09	0.16	0.12
	TDS (g/L)	0.124	0.213	0.16
LABORATORY	Alkalinity (ppm)	99	174	132
	Chloride (ppm)	3.4	20.4	12.8
	Color (PCU)	<5	10	5.5
	Specific Conductance (umhos/cm)	202	352	292.8
	Sulfate (ppm)	<1.25	12.5	6.23
	TDS (ppm)	139	264	194.8
	TSS (ppm)	<4	<4	<4
	Turbidity (NTU)	<1	5.4	1.48
	Ammonia (ppm)	0.18	0.33	0.27
	Hardness (ppm)	<5	<5	<5
	Nitrite-Nitrate, as N (ppm)	<0.05	<0.05	<0.05
	TKN (ppm)	0.25	0.58	0.41
	Phosphorous (ppm)	0.3	1.1	0.55

Table 5-5 Inorganic Statistics

Fiscal Year 2004

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (ppb)	<60	<60	<60
Arsenic (ppb)	<10	<10	<10
Barium (ppb)	<200	<200	<200
Beryllium (ppb)	<5	<5	<5
Cadmium (ppb)	<5	<5	<5
Chromium (ppb)	<10	<10	<10
Copper (ppb)	<10	<10	<10
Iron (ppb)	<100	520	268.00
Lead (ppb)	<3	6.91	<3
Mercury (ppb)	<0.2	<0.2	<0.20
Nickel (ppb)	<40	<40	<40
Selenium (ppb)	<10	<10	<10
Thallium (ppb)	<10	<10	<10
Zinc (ppb)	<20	33.4	<20

Table 5-6 Three-year Field, Water Quality and Nutrients Averages

	PARAMETER	FY 1995 AVERAGE	FY 1998 AVERAGE	FY 2001 AVERAGE	FY 2004 AVERAGE
FIELD	Temperature ^{O}C	23.71	22.45	22.47	23.46
	pH (SU)	8.03	6.31	7.78	7.59
	Sp. Conductivity (mmhos/cm)	0.37	0.23	0.28	0.25
	Salinity (ppt)	0.16	0.11	0.18	0.12
	TDS (g/L)	-	-	-	0.16
LABORATORY	Alkalinity (ppm)	122.76	109.64	135.55	131.80
	Chloride (ppm)	13.86	14.70	10.88	12.80
	Color (PCU)	6.67	5.00	6.17	5.50
	Sp. Conductivity (umhos/cm)	288.67	268.51	302.33	292.80
	Sulfate (ppm)	8.66	4.56	4.55	6.23
	TDS (ppm)	245.33	265.43	257.83	194.80
	TSS (ppm)	<4	5.71	<4	<4
	Turbidity (NTU)	6.43	<1	1.72	1.48
	Ammonia (ppm)	0.22	0.16	0.20	0.27
	Hardness (ppm)	<5	<5	<5	<5
	Nitrite-Nitrate, as N (ppm)	<0.05	<0.05	<0.05	<0.05
	TKN (ppm)	0.50	0.18	0.38	0.41
	Phosphorus (ppm)	0.25	0.22	0.37	0.55

Table 5-7 Three-year Inorganic Averages

PARAMETER	FY 1995 AVERAGE	FY 1998 AVERAGE	FY 2001 AVERAGE	FY 2004 AVERAGE
Antimony (ppb)	<5	<5	<5	<30
Arsenic (ppb)	<5	<5	<5	<10
Barium (ppb)	8.06	63.6	4.6	<200
Beryllium (ppb)	<5	<5	<5	<5
Cadmium (ppb)	<5	<5	<5	<5
Chromium (ppb)	<5	<5	<5	<10
Copper (ppb)	84.1	<5	5.5	<10
Iron (ppb)	1,076.1	412.7	231.8	268
Lead (ppb)	23.2	<5	46.7	<3
Mercury (ppb)	<0.05	<0.05	<0.05	<0.2
Nickel (ppb)	6.10	<5	6.88	<40
Selenium (ppb)	<5	<5	<5	<10
Silver (ppb)	<5	<5	<5	-
Thallium (ppb)	<5	<5	<5	<10
Zinc (ppb)	177.4	42.2	64.87	<20

Table 5-8 VOC Analytical Parameters

BASELINE MONITORING PROGRAM

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
1,1-DICHLOROETHANE	624	75343	2
1,1-DICHLOROETHENE	624	75354	2
1,1,1-TRICHLOROETHANE	624	71556	2
1,1,2-TRICHLOROETHANE	624	79005	2
1,1,2,2-TETRACHLOROETHANE	624	79345	2
1,2-DICHLOROBENZENE	624	95501	2
1,2-DICHLOROETHANE	624	107062	2
1,2-DICHLOROPROPANE	624	78875	2
1,3-DICHLOROBENZENE	624	541731	2
1,4-DICHLOROBENZENE	624	106467	2
BENZENE	624	71432	2
BROMOFORM	624	75252	2
CARBON TETRACHLORIDE	624	56235	2
CHLOROBENZENE	624	108907	2
DIBROMOCHLOROMETHANE	624	124481	2
CHLOROETHANE	624	75003	2
CIS-1,3-DICHLOROPROPENE	624	10061015	2
BROMODICHLOROMETHANE	624	75274	2
METHYLENE CHLORIDE	624	75092	2
ETHYLBENZENE	624	100414	2
BROMOMETHANE	624	74839	2
CHLOROMETHANE	624	74873	2
METHYLENE CHLORIDE	624	75092	2
O-XYLENE	624	95476	2
STYRENE	624	100425	2
METHYL-t-BUTYL ETHER	624	1634044	2
TETRACHLOROETHENE	624	127184	2
TOLUENE	624	108883	2
TRANS-1,2-DICHLOROETHENE	624	156605	2
TRANS-1,3-DICHLOROPROPENE	624	10061026	2
TRICHLOROETHENE	624	79016	2
TRICHLOROFLUOROMETHANE	624	75694	2
CHLOROFORM	624	67663	2
VINYL CHLORIDE	624	75014	2

PQL = Practical Quantitation Limit
ppb = parts per billion

Table 5-9 Semi-volatile Analytical Parameters

BASELINE MONITORING PROGRAM

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
1,2-Dichlorobenzene	625	95501	10
1,2,3-Trichlorobenzene	625	87616	10
1,2,3,4-Tetrachlorobenzene	625	634662	10
1,2,4-Trichlorobenzene	625	120821	10
1,2,4,5-Tetrachlorobenzene	625	95943	10
1,3-Dichlorobenzene	625	541731	10
1,3,5-Trichlorobenzene	625	108703	10
1,4-Dichlorobenzene	625	106467	10
2-Chloronaphthalene	625	91587	10
2-Chlorophenol	625	95578	20
2-Methyl-4,6-dinitrophenol	625	534521	20
2-Nitrophenol	625	88755	20
2,4-Dichlorophenol	625	120832	20
2,4-Dimethylphenol	625	105679	20
2,4-Dinitrophenol	625	51285	20
2,4-Dinitrotoluene	625	121142	10
2,4,6-Trichlorophenol	625	88062	20
2,6-Dinitrotoluene	625	606202	10
3,3'-Dichlorobenzidine	625	91941	10
4-Bromophenyl phenyl ether	625	101553	10
4-Chloro-3-methylphenol	625	59507	20
4-Chlorophenyl phenyl ether	625	7005723	10
4-Nitrophenol	625	100027	20
Acenaphthene	625	83329	10
Acenaphthylene	625	208968	10
Anthracene	625	120127	10
Benzidine	625	92875	20
Benzo(a)pyrene	625	50328	10
Benzo(k)fluoranthene	625	207089	10
Benzo[a]anthracene	625	56553	10
Benzo[b]fluoranthene	625	205992	10
Benzo[g,h,i]perylene	625	191242	10
Bis(2-chloroethoxy)methane	625	111911	10
Bis(2-ethylhexyl)phthalate	625	117817	10
Bis(2-chloroethyl)ether	625	111444	10
Bis(2-chloroethyl)ether	625	111444	10
Bis(2-chloroisopropyl)ether	625	108601	10
Butylbenzylphthalate	625	85687	10
Chrysene	625	218019	10
Diethylphthalate	625	84662	10
Dimethylphthalate	625	131113	10
Di-n-butylphthalate	625	84742	10
Di-n-octylphthalate	625	117840	10

Table 5-9 (Cont'd)
Semivolatile Parameters

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
Fluoranthene	625	206440	10
Fluorene	625	86737	10
Hexachlorobenzene	625	118741	10
Hexachlorobutadiene	625	87683	10
Hexachlorocyclopentadiene	625	77474	10
Hexachloroethane	625	67721	10
Indeno[1,2,3-cd]pyrene	625	193395	10
Isophorone	625	78591	10
Naphthalene	625	91203	10
Nitrobenzene	625	98953	10
N-Nitrosodimethylamine	625	62759	10
N-Nitrosodiphenylamine	625	86306	10
N-nitroso-di-n-propylamine	625	621647	10
Pentachlorobenzene	625	608935	10
Pentachlorophenol	625	87865	20
Phenanthrene	625	85018	10
Phenol	625	108952	20
Pyrene	625	129000	10

Table 5-10 Pesticide and PCB Analytical Parameters

BASELINE MONITORING PROGRAM

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
4,4'-DDD	8081	72548	0.1
4,4'-DDE	8081	72559	0.1
4,4'-DDT	8081	50293	0.1
Aldrin	8081	309002	0.05
alpha-BHC	8081	319846	0.05
beta-BHC	8081	319857	0.05
delta-BHC	8081	319868	0.05
gamma-BHC	8081	58899	0.05
Chlordane	8081	57749	0.5
Dieldrin	8081	60571	0.1
Endosulfan I	8081	959988	0.05
Endosulfan II	8081	33213659	0.1
Endosulfan sulfate	8081	1031078	0.1
Endrin	8081	72208	0.1
Endrin aldehyde	8081	7421934	0.1
Heptachlor	8081	76448	0.05
Heptachlor epoxide	8081	1024573	0.05
Methoxychlor	8081	72435	0.5
Toxaphene	8081	8001352	5
Aroclor-1016	8082	12674112	1
Aroclor-1221	8082	11104282	1
Aroclor-1232	8082	11141165	1
Aroclor-1242	8082	53469219	1
Aroclor-1248	8082	12672296	1
Aroclor-1254	8082	11097691	1
Aroclor-1260	8082	11096825	1

BASELINE MONITORING PROGRAM WELLS OF THE CATAHOULA 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 5-1 Location Plat, Catahoula Aquifer

CATAHOULA AQUIFER - pH

Baseline Monitoring Program, FY2004

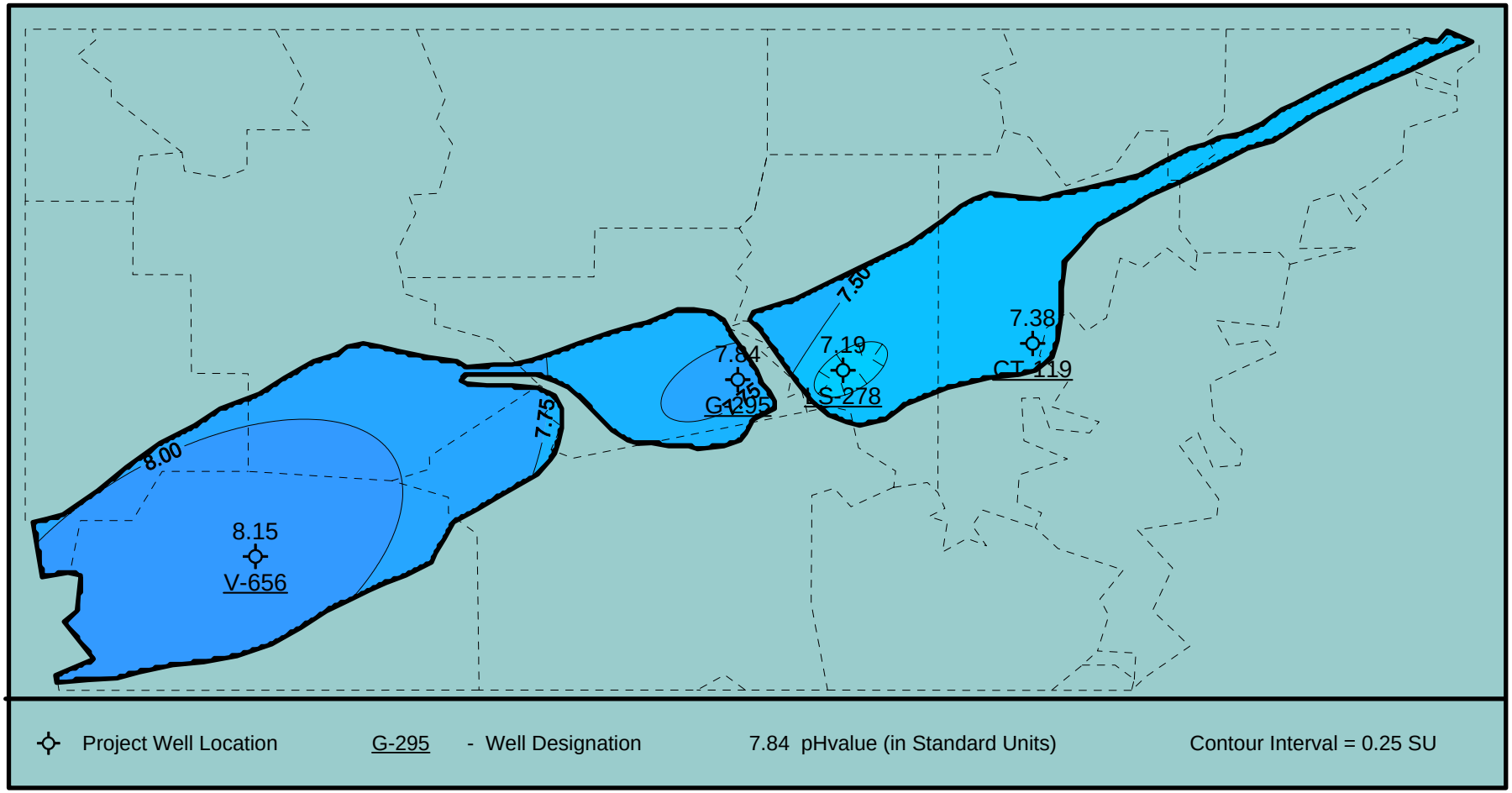

Figure 5-2 Map of pH Data

CATAHOULA AQUIFER - TDS

Baseline Monitoring Program, FY2004

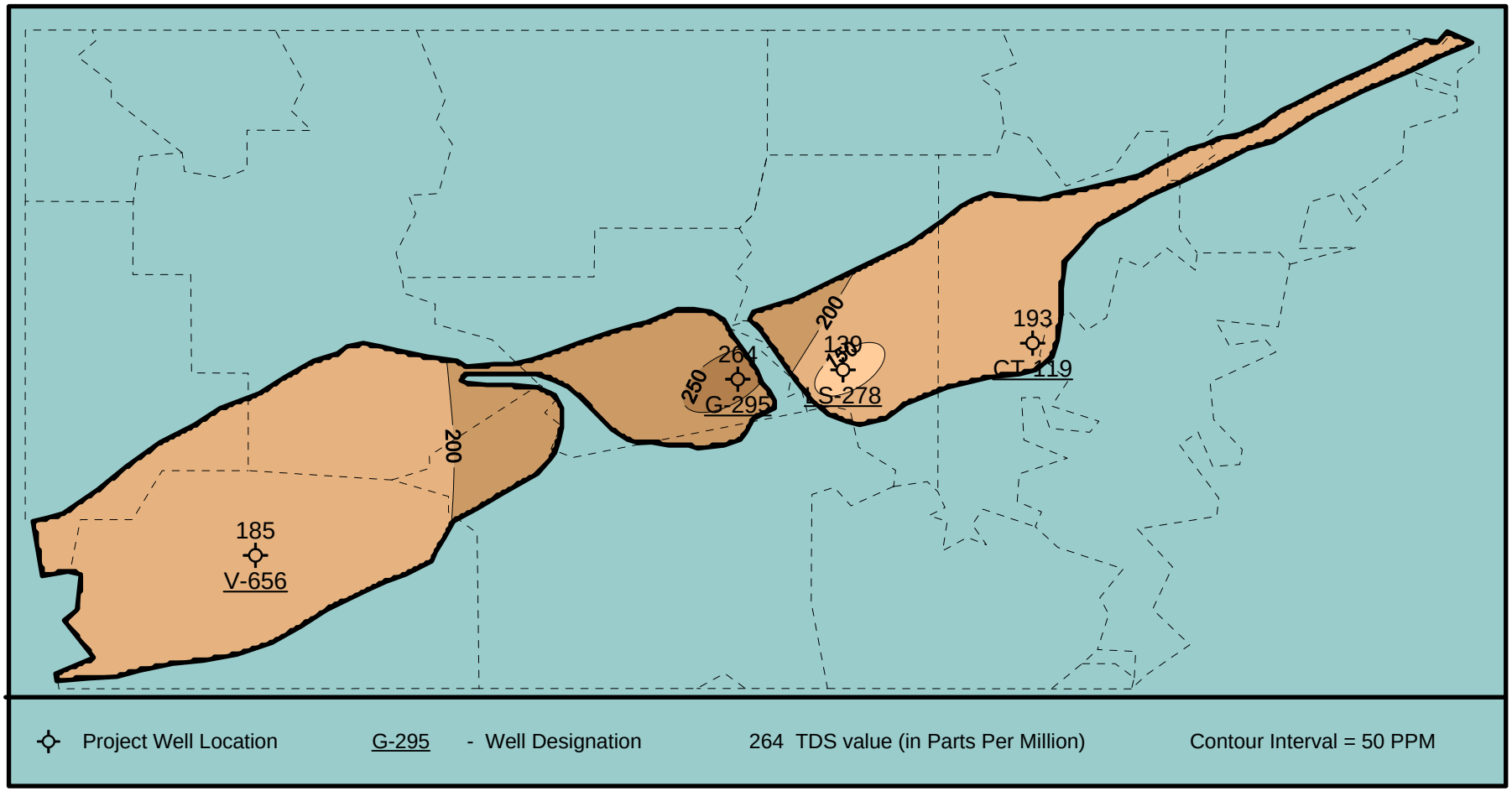

Figure 5-3 Map of TDS Data

CATAHOULA AQUIFER - Chloride

Baseline Monitoring Program, FY2004

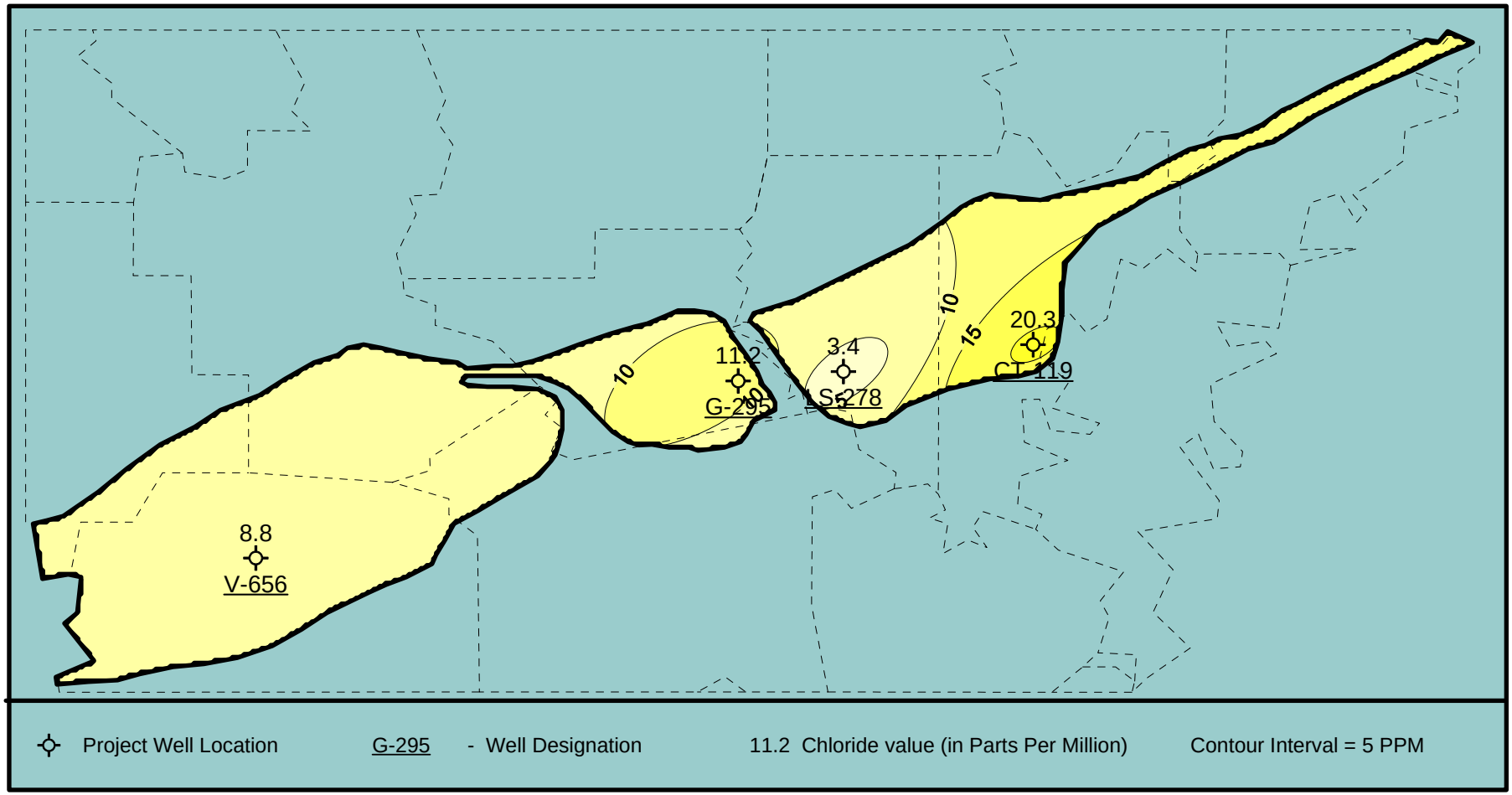

Figure 5-4 Map of Chloride Data

CATAHOULA AQUIFER - Iron

Baseline Monitoring Program, FY2004

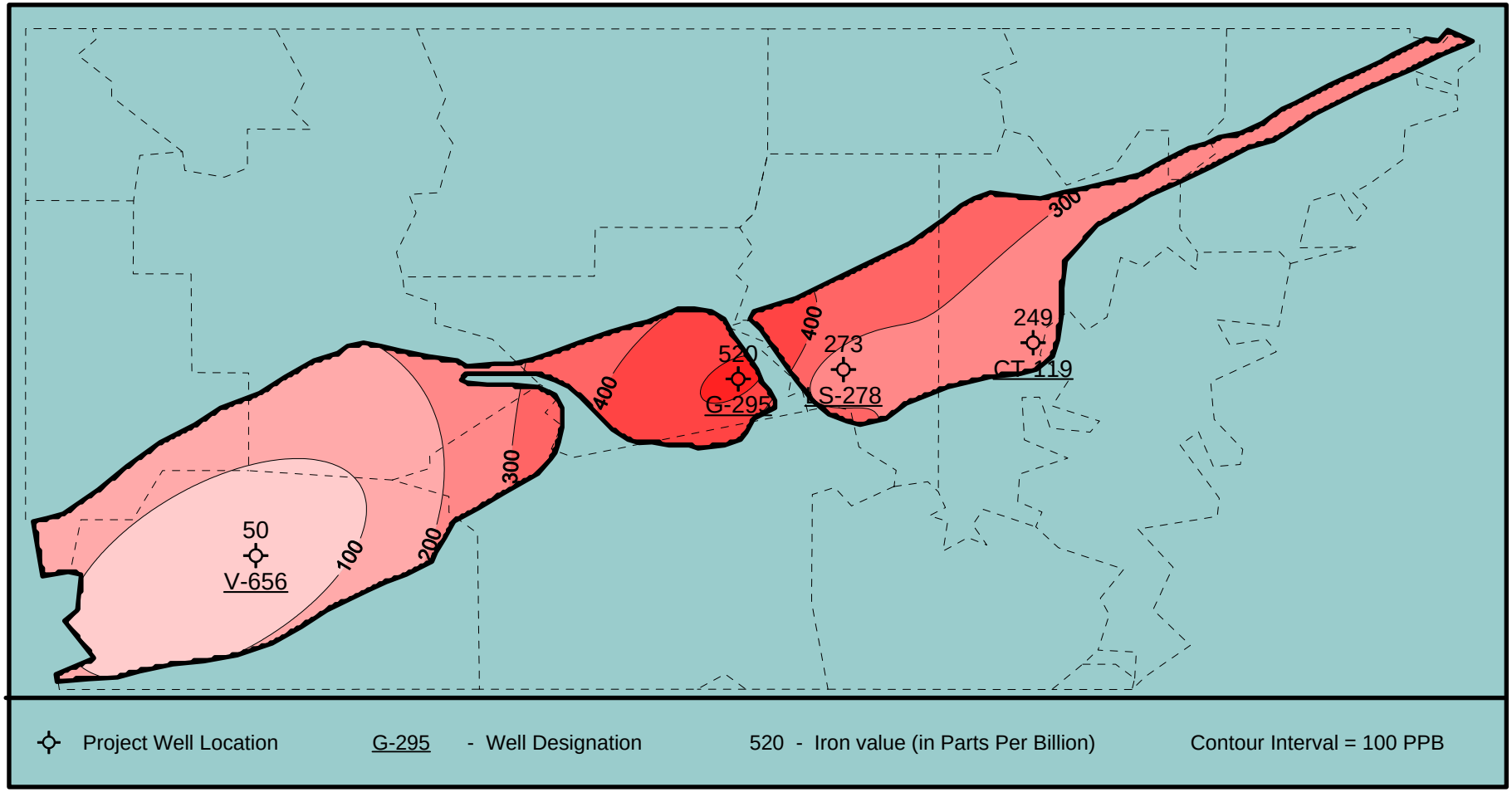

Figure 5-5 Map of Iron Data