WILLIAMSON CREEK AQUIFER SUMMARY

BASELINE MONITORING PROGRAM, FY 2006

APPENDIX 11

OF THE

TRIENNIAL SUMMARY REPORT

FOR THE

WATER QUALITY ASSESSMENT DIVISION

OF

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

PARTIAL FUNDING PROVIDED THROUGH THE CWA

WILLIAMSON CREEK AQUIFER SUMMARY

BACKGROUND

In order to better assess the water quality of a particular aquifer at a given point in time, an attempt was made to sample all Baseline Monitoring Program (BMP) 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 part of the Baseline Monitoring Program Triennial Summary Report.

Figure 11-1 shows the geographic locations of the Williamson Creek aquifer and the associated wells, whereas Table 11-2 lists the wells in the aquifer along with their total depths and the use made of produced waters and date sampled.

In July and August of 2005, seven wells were sampled which produce from the Williamson Creek aquifer. Three of the wells are classified as public supply wells, two are industrial wells, and two are domestic wells. The wells are located in four parishes, in central and southwest Louisiana.

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

GEOLOGY

The Williamson Creek member consists of sands, silts, silty clays, and some gravel. The Williamson Creek member, along with the Carnahan Bayou 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 Williamson Creek varies between 20-260 feet/day.

The maximum depths of occurrence of freshwater in the Williamson Creek range from 175 feet above sea level, to 2,450 feet below sea level. The range of thickness of the fresh water interval in the Williamson Creek is 50 to 1,250 feet. The depths of the Williamson Creek wells that were monitored in conjunction with the BMP range from 190 to 1,657 feet.

INTERPRETATION OF DATA

FIELD, WATER QUALITY, AND NUTRIENTS PARAMETERS

Table 11-3 lists the field parameters that are checked and the water quality and nutrients parameters for which samples are collected from each well. It also shows the field results and the water quality and nutrients analytical results for each well. Table 11-5 lists the minimum, maximum, and average results for the field data, water quality data, and nutrients data for the Williamson Creek aquifer.

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 on Table 11-3 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 11-3 show that the following secondary MCL (SMCL) was exceeded.

Color – SMCL = 15 PCU
V-420 – 110 PCU

Comparison To Historical Data

Table 11-7 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). These data averages show that temperature, chloride, specific conductance and TKN have increased while total phosphorus has decreased. The remaining water quality parameters have remained generally consistent with only moderate fluctuations.

INORGANIC PARAMETERS

Table 11-4 shows the inorganic (total metals) parameters for which samples were collected and the analytical results for those parameters for each well. Table 11-6 lists the minimum, maximum, and average results for the inorganic data for the Williamson Creek aquifer.

Federal Primary Drinking Water Standards

A review of the analyses listed on Table 11-4 shows that no Primary Drinking Water Standard (MCL) was exceeded for inorganics.

Federal Secondary Drinking Water Standards

Laboratory data contained in Table 11-4 show that the following secondary SMCL was exceeded:

Iron – SMCL = 300 ppb

CO-163 – 392 ppb, duplicate – 376 ppb V-420 – 4,480 ppb

Comparison To Historical Data

Table 11-8 lists the current inorganic data averages alongside the inorganic data averages for the three previous sampling rotations (three, six and nine years prior). A comparison shows that the barium average has fluctuated; copper and nickel averages decreased to below their respective detection levels between FY 1996 and FY 2000 and have stayed below them. The average concentration for zinc has decreased steadily while iron has increased. All other averages were consistently below their respective detection levels.

VOLATILE ORGANIC COMPOUNDS

Table 11-9 shows the volatile organic compound (VOC) parameters for which samples were collected. 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.

There were no confirmed detections of VOCs for the FY 2006 sampling of the Williamson Creek Aquifer.

SEMIVOLATILE ORGANIC COMPOUNDS

Table 11-10 shows the semivolatile organic compound parameters for which samples were collected. 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 semivolatile would be discussed in this section.

Laboratory data show that public supply well V-420 reported a value of 11.7 ppb for bis(2-ethylhexyl)phthalate, (BEHP). Because this is a public supply well and that it exceeded the MCL for BEHP, which is 6 ppb, the well was resampled. Laboratory analyses from the resample and its duplicate did not confirm the original results in that the resample and duplicate were non-detect for BEHP. Therefore, it is the opinion of this office that the bis(2-ethylhexyl)phthalate concentrations exhibited in the original sample of well V-420 are invalid and are rejected.

Taking this into consideration, there were no confirmed detections of semivolatile organic compounds for the FY 2006 sampling of the Williamson Creek aquifer.

PESTICIDES AND PCBS

Table 11-11 shows the pesticide and PCB parameters for which samples were collected. 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.

There were no confirmed detections of a pesticide or PCB for the FY 2006 sampling of the Williamson Creek aquifer.

COMMON WATER CHARACTERISTICS

Table 11-1 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 Williamson Creek aquifer for total dissolved solids (TDS), hardness, chloride, iron, and nitrite-nitrate are listed in the table. Figures 11-2, 11-3 and 11-4 respectively, represent the contoured data for TDS, chloride and iron. The data values that are contoured and reported in the contour maps are derived from the initial current sampling of each well with any duplicate samples or resamples averaged into them. The data average for hardness shows that the ground water produced from this aquifer is soft[1].

Table 11-1 Common Water Characteristics
Fiscal Year 2006

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
PH (SU)	No Statistics Available - pH Probe Broken		
TDS (ppm)	147	372	284.8
Hardness (ppm)	9.7	147	34.5
Chloride (ppm)	5.6	93.7	41.48
Iron (ppb)	<20	4,480	641.6
Nitrite-Nitrate (ppm)	<0.05	0.26	<0.05

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

SUMMARY AND RECOMMENDATIONS

In summary, the data show that the ground water produced from the Williamson Creek aquifer is soft and that no primary MCL was exceeded. Furthermore, this aquifer is of excellent quality when considering taste, odor, or appearance guidelines in that only two secondary standards (iron and color) were exceeded. A comparison of present and historical BMP data averages shows that temperature, chloride, specific conductance, TKN and iron have increased while phosphorus, copper, nickel and zinc have decreased. The remaining data averages show only moderate fluctuations with many remaining below their respective detection limits.

It is recommended that the wells assigned to the Williamson Creek aquifer be resampled as planned in approximately three years. In addition, several wells should be added to those currently in place to increase the well density for this aquifer.

Table 11-2 List of Wells Sampled

DOTD Well Name	PARISH	SAMPLE DATE	Owner	Depth (in feet)	Well Use
BE-407	BEAUREGARD	7/25/2005	BOISE CASCADE	1,657	INDUSTRIAL
CO-163	CONCORDIA	8/16/2005	U. S. ARMY CORPS OF ENG.	513	PUBLIC SUPPLY
R-1362	RAPIDES	7/26/2005	INTERNATIONAL PAPER CO.	402	INDUSTRIAL
R-932	RAPIDES	7/26/2005	CITY OF ALEXANDRIA	466	PUBLIC SUPPLY
V-420	VERNON	7/25/2005	U.S. ARMY/FORT POLK	920	PUBLIC SUPPLY
V-5858Z	VERNON	7/26/2005	PRIVATE OWNER	248	DOMESTIC
V-8681Z	VERNON	8/16/2005	PRIVATE OWNER	190	DOMESTIC

Table 11-3 Summary of Water Quality 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	1.3/1.25	4.0	4.0	1.0
	FIELD PARAMETERS					LABORATORY PARAMETERS												
BE-407	†	0.20	0.41	0.27	31.56	204	0.54	6.2	<5	9.8	<0.05	0.68	0.14	409	9.4	271	<4	<1
BE-407*	†	0.20	0.41	0.27	31.56	204	0.47	6.3	<5	9.7	<0.05	1.12	0.14	410	9.3	275	<4	<1
CO-163	7.52	0.29	0.6	0.39	22.27	155	0.43	93.7	<5	26.1	<0.05	0.63	0.18	608	<1.3	364	16	7.9
CO-163*	7.52	0.29	0.6	0.39	22.27	156	0.45	93.7	<5	26.1	<0.05	1.21	0.17	609	<1.3	362	15	6.8
R-1362	†	0.29	0.6	0.39	22.61	118	0.31	86.4	5	27.9	<0.05	0.87	0.06	606	40.2	372	<4	<1
R-932	†	0.22	0.45	0.29	23.59	233	0.33	10.7	<5	18.1	<0.05	0.98	0.08	456	<1.3	280	<4	<1
V-420	†	0.12	0.24	0.16	26.14	98.4	0.26	18.2	110	22.3	<0.05	0.3	0.15	252	3.3	224	<4	5.4
V-5858Z	†	0.23	0.47	0.30	26.09	154	<0.1	52.5	<5	147	0.26	<0.1	<0.05	471	3.3	268	<4	<1
V-8681Z	6.88	0.07	0.14	0.09	22.16	61.5	0.15	5.6	<5	23.3	<0.05	0.46	0.36	147	4.7	147	<4	<1

* Denotes Duplicate Sample
† pH Probe Broken

Table 11-4 Summary of 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	Silver ppb	Thallium ppb	Zinc ppb
Laboratory Detection Limits	10	10	1	1	1	5	10	20	10	0.05	5	5	10	5	20
BE-407	<10	<10	31.6	<1	<1	<5	<10	<20	<10	<0.05	<5	<5	<10	<5	<20
BE-407*	<10	<10	31	<1	<1	<5	<10	<20	<10	<0.05	<5	<5	<10	RB	<20
CO-163	<10	<10	94.2	<1	<1	<5	<10	392	<10	<0.05	<5	<5	<10	<5	541
CO-163*	<10	<10	106	<1	<1	<5	<10	376	<10	<0.05	<5	<5	<10	<5	388
R-1362	<10	<10	69.2	<1	<1	<5	<10	267	<10	<0.05	<5	<5	<10	<5	<20
R-932	<10	<10	47.9	<1	<1	<5	<10	23.5	<10	<0.05	<5	<5	<10	RB	<20
V-420	<10	<10	52.3	<1	<1	<5	<10	4,480	<10	<0.05	<5	<5	<10	<5	<20
V-5858Z	<10	<10	349	<1	<1	<5	<10	183	<10	<0.05	<5	<5	<10	<5	<20
V-8681Z	<10	<10	46.6	<1	<1	<5	<10	32.9	<10	<0.05	<5	<5	<10	<5	38.3

* Denotes Duplicate Sample
RB – Data Rejected, Thallium Detected in Laboratory Method Blank

Table 11-5 Water Quality Statistics

Fiscal Year 2006

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	Temperature (^{O}C)	22.16	31.56	25.27
	pH (SU)	No Statistics Available - pH Probe Broken		
	Specific Conductance (mmhos/cm)	0.14	0.6	0.44
	Salinity (ppt)	0.07	0.29	0.21
	TDS (g/L)	0.09	0.39	0.28
LABORATORY	Alkalinity (ppm)	61.5	233	153.8
	Chloride (ppm)	5.6	93.7	41.48
	Color (PCU)	<5	110	14.72
	Specific Conductance (umhos/cm)	147	609	440.9
	Sulfate (ppm)	<1.3	40.2	8.02
	TDS (ppm)	147	372	284.8
	TSS (ppm)	4	16	<4
	Turbidity (NTU)	1	7.9	2.6
	Ammonia, as N (ppm)	<0.1	0.54	0.33
	Hardness (ppm)	9.7	147	34.5
	Nitrate - Nitrite, as N (ppm)	<0.05	0.26	<0.05
	TKN (ppm)	<0.1	1.21	0.70
	Total Phosphorous (ppm)	<0.05	0.36	0.15

Table 11-6 Inorganic Statistics

Fiscal Year 2006

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (ppb)	<10	<10	<10
Arsenic (ppb)	<10	<10	<10
Barium (ppb)	31	349	91.98
Beryllium (ppb)	<1	<1	<1
Cadmium (ppb)	<1	<1	<1
Chromium (ppb)	<5	<5	<5
Copper (ppb)	<10	<10	<10
Iron (ppb)	<20	4,480	641.6
Lead (ppb)	<10	<10	<10
Mercury (ppb)	<0.05	<0.05	<0.05
Nickel (ppb)	<5	<5	<5
Selenium (ppb)	<5	<5	<5
Silver (ppb)	<10	<10	<10
Thallium (ppb)	<5	<5	<5
Zinc (ppb)	<20	541	114.1

Table 11-7 Three-year Water Quality Statistics

	PARAMETER	FY 1996 AVERAGE	FY 2000 AVERAGE	FY 2003 AVERAGE	FY 2006 AVERAGE
FIELD	Temperature (^{O}C)	23.82	23.12	24.00	25.27
	pH (SU)	6.86	7.83	7.54	Not Available
	Specific Conductance (mmhos/cm)	0.369	0.424	0.384	0.44
	Field Salinity (ppt)	0.18	0.20	0.18	0.21
LABORATORY	Alkalinity (ppm)	136.1	150.3	139.6	153.8
	Chloride (ppm)	38.7	37.0	32.3	41.48
	Color (ppm)	12.1	5.0	<5	14.72
	Specific Conductance (umhos/cm)	385.7	398.8	369.4	440.9
	Sulfate (ppm)	7.15	4.61	4.61	8.02
	TDS (ppm)	211.3	272.7	235.7	284.8
	TSS (ppm)	<4	<4	<4	<4
	Turbidity (NTU)	1.25	6.03	1.23	2.6
	Ammonia, as N (ppm)	0.36	0.19	0.25	0.33
	Hardness (ppm)	30.8	39.5	34.9	34.5
	Nitrate - Nitrite, as N (ppm)	<0.05	0.15	0.05	<0.05
	TKN (ppm)	0.32	0.40	0.39	0.70
	Total Phosphorous (ppm)	0.30	0.20	0.18	0.15

Table 11-8 Three-year Inorganic Statistics

PARAMETER	FY 1996 AVERAGE	FY 2000 AVERAGE	FY 2003 AVERAGE	FY 2006 AVERAGE
Antimony (ppb)	<5	<5	<5	<10
Arsenic (ppb)	<5	<5	<5	<10
Barium (ppb)	48.21	112.50	89.57	91.98
Beryllium (ppb)	<1	<1	<1	<1
Cadmium (ppb)	<1	<1	<1	<1
Chromium (ppb)	<5	<5	<5	<5
Copper (ppb)	9.70	<5	<5	<10
Iron (ppb)	466.00	115.28	380.1	641.6
Lead (ppb)	<10	<10	<10	<10
Mercury (ppb)	<0.05	<0.05	<0.05	<0.05
Nickel (ppb)	9.25	<5	<5	<5
Selenium (ppb)	<5	<5	<5	<5
Silver (ppb)	<1	<1	<1	<10
Thallium (ppb)	<5	<5	<5	<5
Zinc (ppb)	298.00	245.22	107.22	114.1

Table 11-9 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	4
TETRACHLOROETHENE	2
TOLUENE	2
TRANS-1,3-DICHLOROPROPENE	2
TRICHLOROETHENE	2
TRICHLOROFLUOROMETHANE	2
CHLOROFORM	2
VINYL CHLORIDE	2

ppb = parts per billion

Table 11-10 List of Semivolatile 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
Dibenzo[a,h]anthracene	10
Diethylphthalate	10
Dimethylphthalate	10

Table 11-10 (Cont'd)
Semivolatile Parameters

COMPOUND	DETECTION LIMIT (ppb)
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

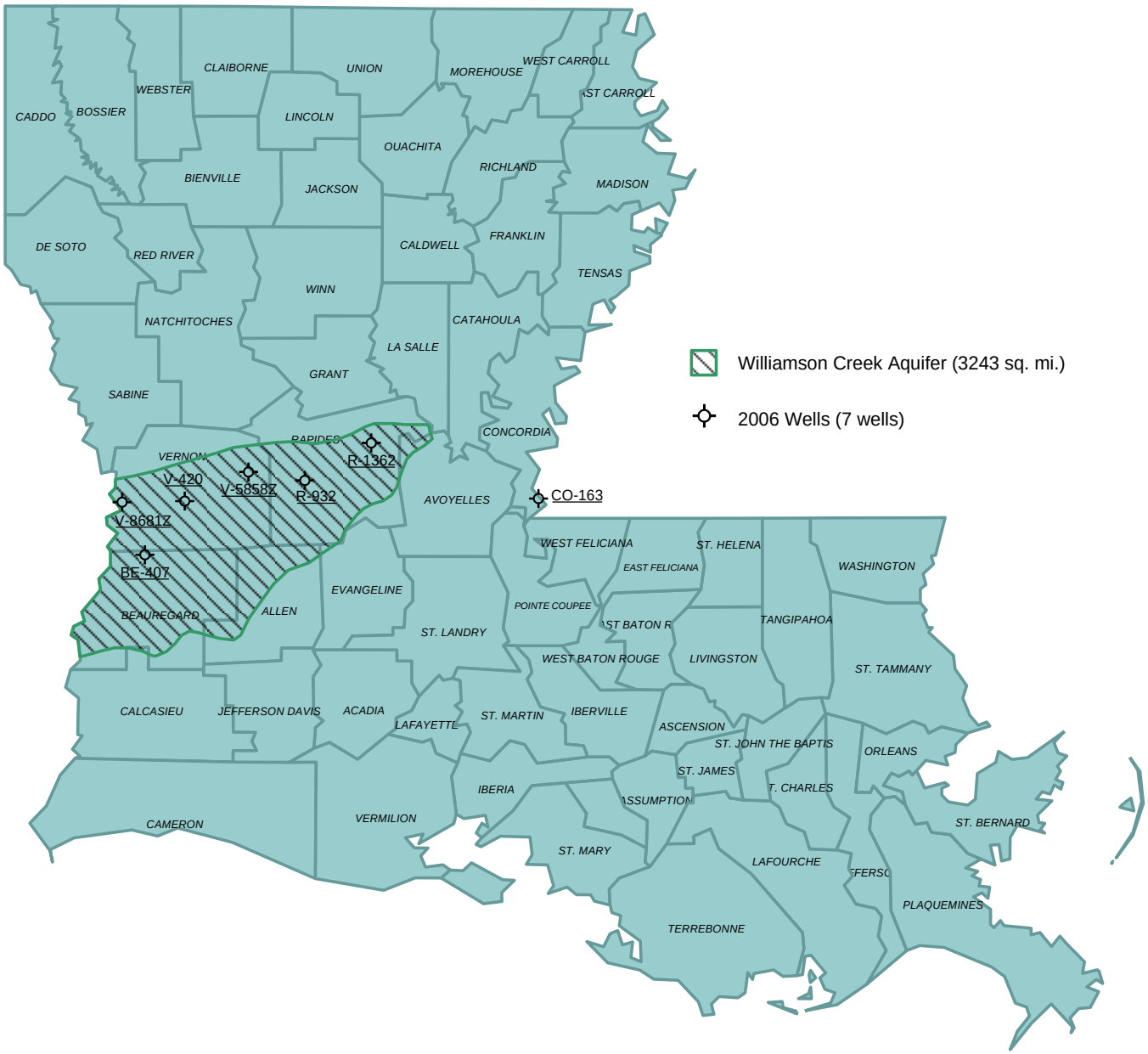
Table 11-11 List of Pesticide and PCB Analytical Parameters

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 WILLIAMSON CREEK AQUIFER



Aquifer boundary digitized from Louisiana Hydrologic Map No. 2: Areal Extent of Freshwater in Major Aquifers of Louisiana. Smoot, 1988; USGS/LDOTD Report 86-4150

Figure 11-1 Location Plat, Williamson Creek Aquifer and Wells

WILLIAMSON CREEK AQUIFER - Total Dissolved Solids

Baseline Monitoring Program, FY2006

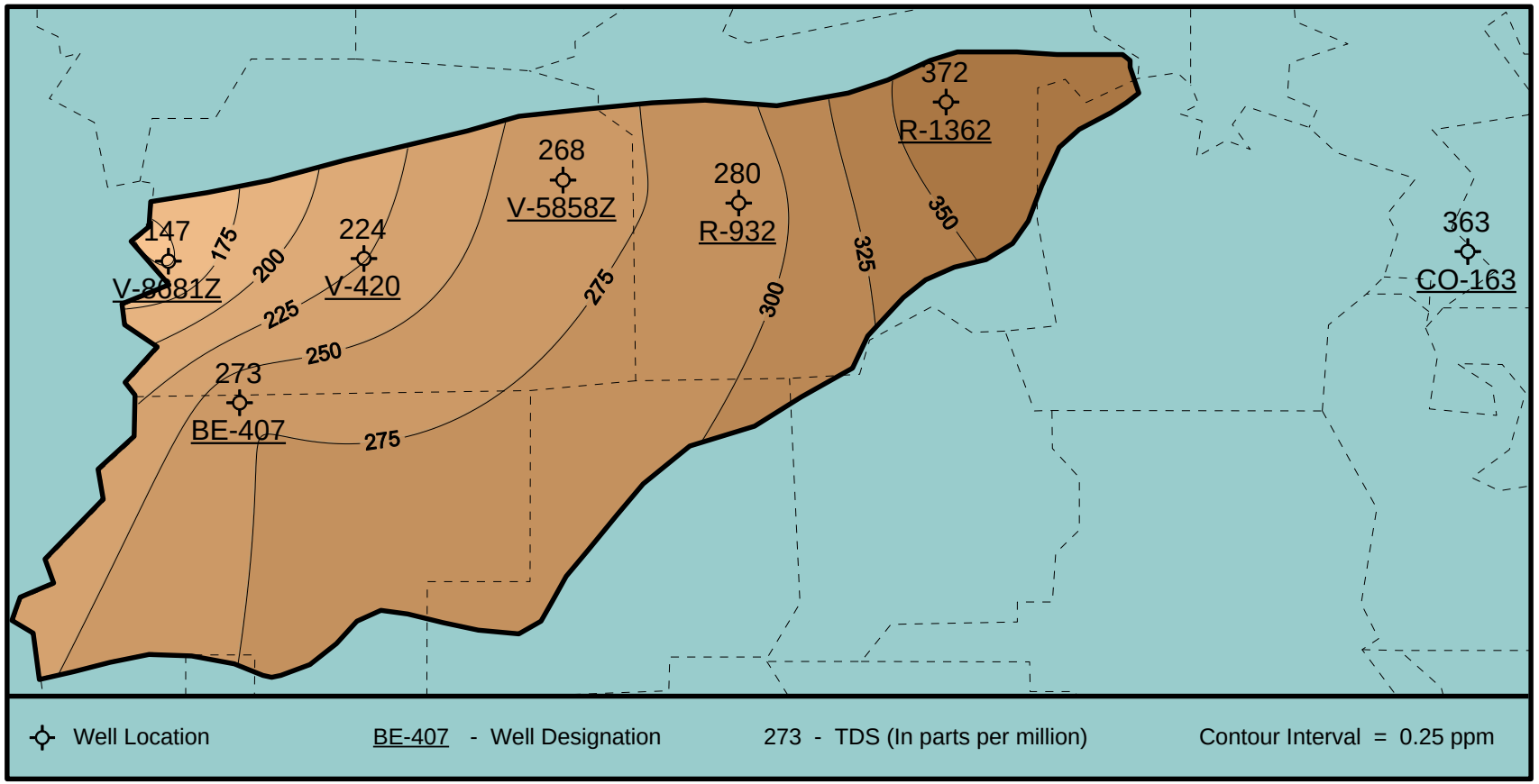


Figure 11-2 Map of TDS Data

WILLIAMSON CREEK AQUIFER - Chloride

Baseline Monitoring Program, FY2006

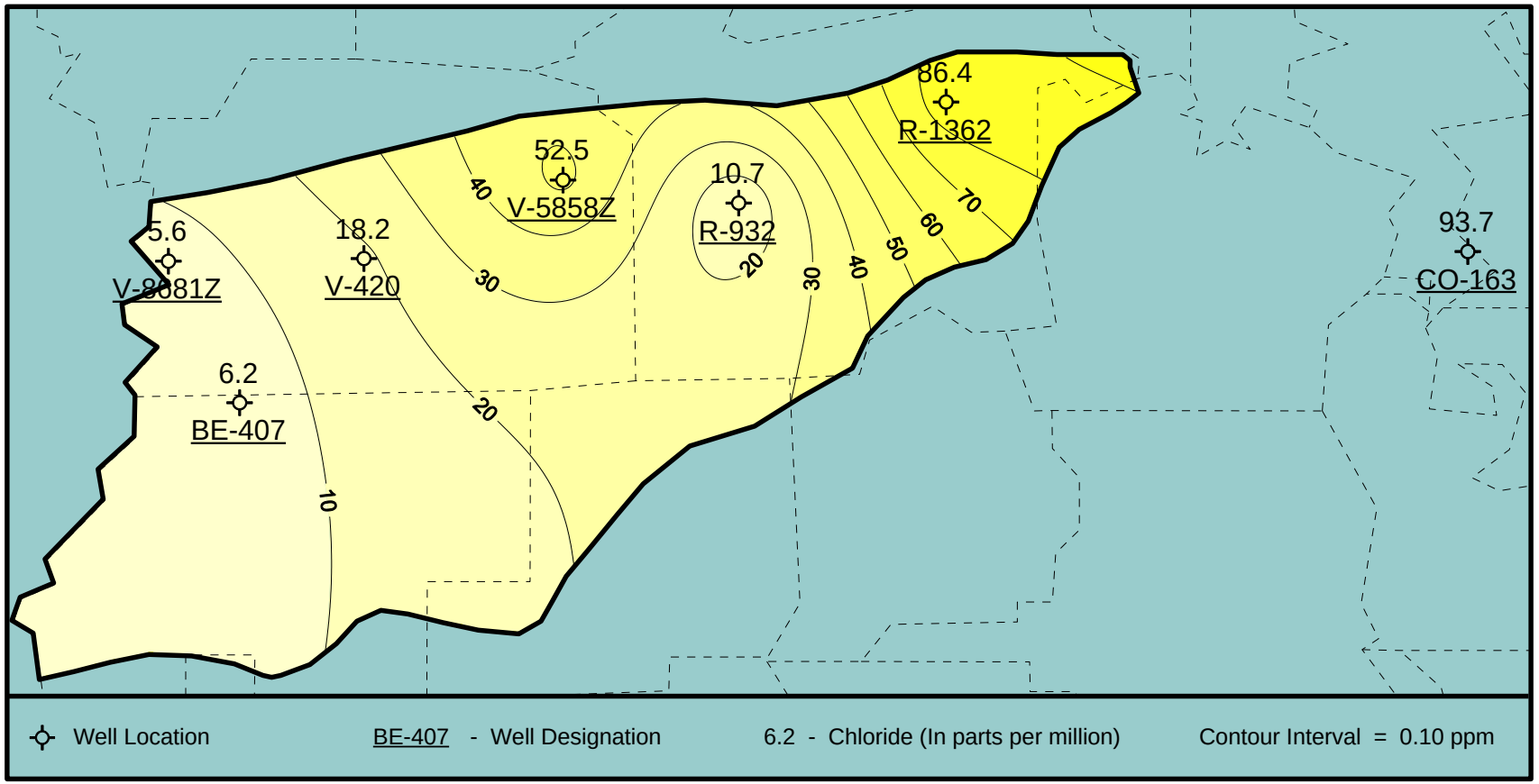


Figure 11-3 Map of Chloride Data

WILLIAMSON CREEK AQUIFER - Iron

Baseline Monitoring Program, FY2006

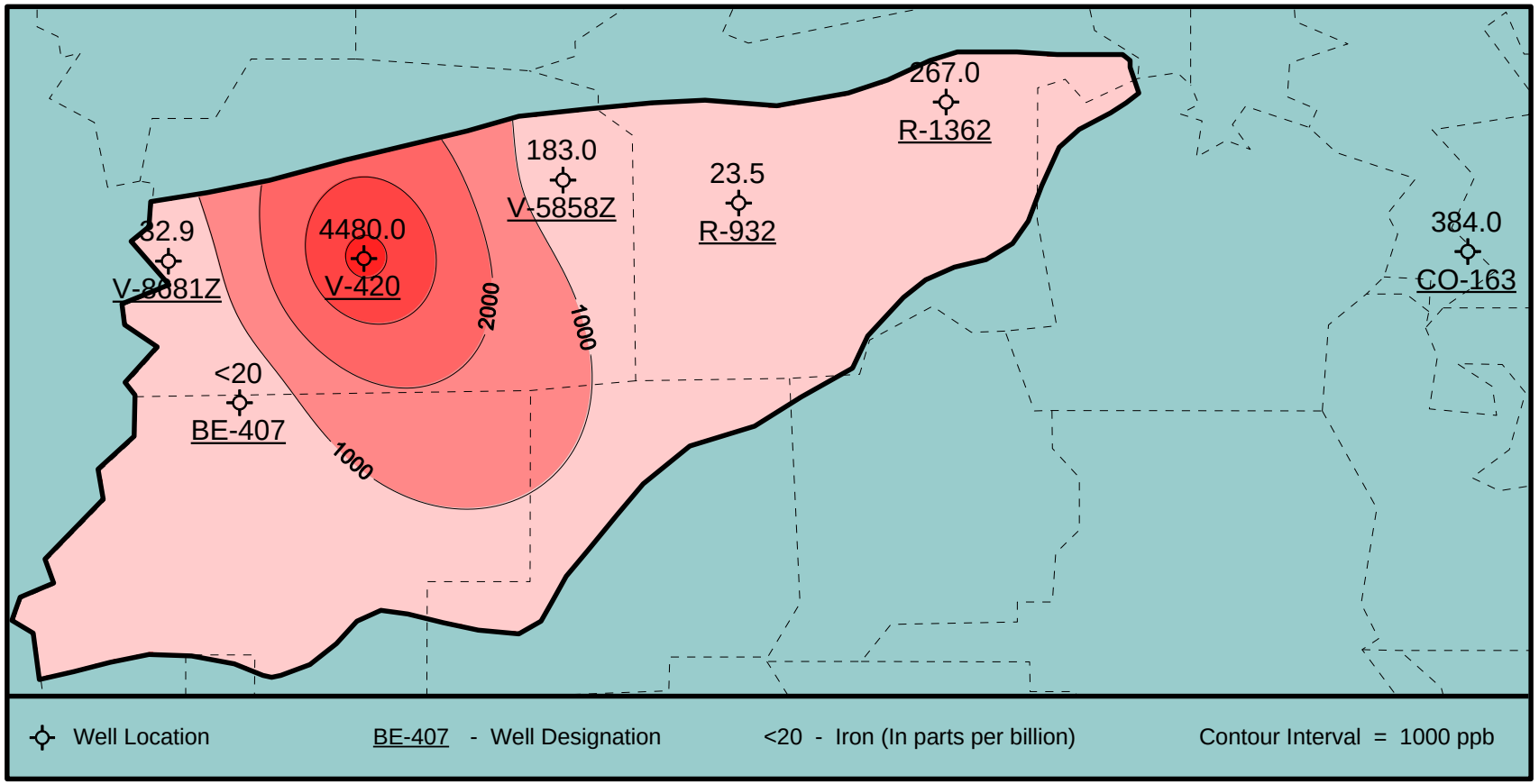


Figure 11-4 Map of Iron Data