RED RIVER ALLUVIAL AQUIFER SUMMARY

BASELINE MONITORING PROGRAM, FY 2004

APPENDIX 3

OF THE

TRIENNIAL SUMMARY REPORT, 2006

FOR THE

WATER QUALITY ASSESSMENT DIVISION

OF

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY

PARTIAL FUNDING PROVIDED THROUGH CWA

RED RIVER ALLUVIAL 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 part of the Baseline Monitoring Program Triennial Summary Report for 2006.

Figure 3-1 shows the geographic locations of the Red River Alluvial aquifer and the associated wells, whereas Table 3-1 lists the wells in the aquifer along with their total depths and the use made of produced waters and date sampled.

In October of 2003, six wells were sampled which produce from the Red River Alluvial aquifer. Three of the wells are classified as irrigation wells, two are classified as domestic wells, and one is an industrial well. The wells are located in five parishes from the central to the northwest part 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

Red River alluvium consists of fining upward sequences of gravel, sand, silt, and clay. The aquifer is poorly to moderately well sorted, with fine-grained to medium-grained sand near the top, grading to coarse sand and gravel in the lower portions. It is confined by layers of silt and clay of varying thicknesses and extent.

HYDROGEOLOGY

The Red River Alluvial aquifer is hydraulically connected with the Red River and its major streams. Recharge is accomplished by direct infiltration of rainfall in the river valley, lateral and upward movement of water from adjacent and underlying aquifers, and overbank stream flooding. The amount of recharge from rainfall depends on the thickness and permeability of the silt and clay layers overlying it. Water levels fluctuate seasonally in response to precipitation trends and river stages. Water levels are generally within 30 to 40 feet of the land surface and movement is downgradient and toward rivers and streams. Natural discharge occurs by seepage of water into the Red River and its streams, but some water moves into the aquifer when stream stages are above aquifer water levels. The hydraulic conductivity varies between 10-530 feet/day.

The maximum depths of occurrence of freshwater in the Red River Alluvial range from 20 feet above sea level, to 160 feet below sea level. The range of thickness of the fresh water interval in the Red River Alluvial is 50 to 200 feet. The depths of the Red River Alluvial wells that were monitored in conjunction with the BMP range from 60 to 96 feet.

PROGRAM PARAMETERS

The field parameters checked at each sampling site and the list of water quality analytical parameters are shown in Table 3-2. The inorganic (total metals) parameters analyzed in the laboratory are listed in Table 3-3. 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 3-8, 3-9 and 3-10 were included in this report.

Tables 3-4 and 3-5 provide an overview of water quality and inorganic data for the Red River Alluvial aquifer, listing the minimum, maximum, and average results for these parameters. Tables 3-6 and 3-7 compare these same parameter averages to historical Baseline Program-derived data for the Red River Alluvial aquifer, from fiscal years 1995, 1998 and 2001.

Figures 3-2, 3-3, 3-4, and 3-5 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 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 3-2 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 3-2 show that the following secondary MCLs (SMCL)s were exceeded.

Chloride – SMCL = 250 ppm)

RR-5095Z – 608 ppm

Color – SMCL = 15 PCU

CD-431 – 20 PCU
CD-586 – 35 PCU
R-6675Z – 45 PCU

Total Dissolved Solids (TDS) – SMCL = 500 ppm (0.5 g/L)

CD-431 – 664 ppm (lab); 0.67 g/L (field)
CD-586 – 882 ppm (lab); 0.86 g/L (field)
G-5193Z – 484* ppm (lab); 0.55 g/l (field)
NA-47 – 516 ppm (lab); 0.53 g/L (field)
NA-47 duplicate – 518 ppm (lab); 0.53 (field)
R-6675Z – 498* ppm (lab); 0.55 (field)
RR-5095Z – 2,138 ppm (lab); 1.64 g/L (field)

* Lab results do not exceed SMCL

Sulfate – SMCL = 250 ppm
RR-5095Z – 1,412 ppm

INORGANIC PARAMETERS

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

Federal Primary Drinking Water Standards: A review of the analyses listed on Table 3-3 shows that no primary MCL was exceeded for total metals, however the action level for lead was exceeded in one well. The Red River parish well, RR-5095Z, reported a lead concentration of 37.7 ppb, more than twice the action level of 15 ppm.

Federal Secondary Drinking Water Standards: Laboratory data contained in Table 3-4 show that the following secondary MCL (SMCL) was exceeded.

Iron – SMCL = 300 ppb
CD-431 – 10,400 ppb
G-5193Z – 10,300 ppb
RR-5095Z – 4,170 ppb
CD-586 – 5,790 ppb
NA-47 – 5,500ppb; duplicate – 5,650 ppb

VOLATILE ORGANIC COMPOUNDS

Table 3-8 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 FY 2004 sampling of the Red River Alluvial aquifer.

SEMI-VOLATILE ORGANICE COMPOUNDS

Table 3-9 shows 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 Red River Alluvial aquifer.

PESTICIDES AND PCBS

Table 3-10 shows the pesticide and PCB 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 pesticide or PCB would be discussed in this section.

No pesticide or PCB was detected during the FY 2004 sampling of the Red River Alluvial aquifer.

COMPARISON TO HISTORICAL BASELINE DATA

Analytical data show that several water quality parameter averages have increased over the past nine years. Most notable are the increased average concentrations for chloride, specific conductance, sulfate, TDS and TSS. Also, field measured pH has increased from 6.67 in FY1995 to 7.22 in FY2004. For this same time period, alkalinity and hardness averages have decreased. These trends may be due to the first time sampling in FY2004 of Red River parish well RR-5095Z instead of changes in the characteristics of the ground water produced from the Red River Alluvial aquifer.

Well RR-5095Z exhibited water quality characteristics significantly different from the other wells sampled producing from this aquifer. When this well's data is removed from the averaged data, the increased concentrations of those parameters noted above show little change or decreases in their respective average values over the past nine years. Without previous data from this well for comparison, definite conclusions cannot be made. However, when the data from well RR-5095Z is removed, it appears that water quality characteristics of the Red River Alluvial aquifer has not changed significantly since FY1995. Table 3-6 lists the field and water quality data averages used for making these comparisons.

Review of historical and current inorganic data over the past nine years show that there are general fluctuations in the data averages, but with no significant consistent changes. These comparisons can be found in table 3-7 of this summary.

SUMMARY AND RECOMMENDATIONS

In summary, the data show that the ground water produced from this aquifer is very hard[1] but is of good quality when considering short-term or long-term health risk guidelines. Laboratory data show that no BMP well that was sampled during the Fiscal Year 2004 monitoring of the Red River Alluvial aquifer exceeded a primary MCL. However one well did exceed the action level for lead. Analytical data from well number RR-5095Z reported lead at 37.7 ppb, where the action level for lead is 15 ppb. The data also show that this aquifer is of poor quality when considering taste, odor, or appearance guidelines.

It is recommended that the wells assigned to the Red River Alluvial aquifer be re-sampled 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.

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

Table 3-1 List of Wells Sampled

WELL NUMBER	PARISH	DATE SAMPLED	OWNER	DEPTH (FEET)	WELL USE
CD-431	CADDO	10/21/2003	CERTAINTEED	62	INDUSTRIAL
CD-586	CADDO	10/21/2003	PRIVATE OWNER	60	IRRIGATION
G-5193Z	GRANT	10/20/2003	PRIVATE OWNER	75	DOMESTIC
NA-47	NATCHITOCHES	10/20/2003	PRIVATE OWNER	80	IRRIGATION
R-6675Z	RAPIDES	10/20/2003	PRIVATE OWNER	96	DOMESTIC
RR-5095Z	RED RIVER	10/20/2003	PRIVATE OWNER	60	IRRIGATION

Table 3-2 Summary of 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												
CD-431	7.39	0.51	1.037	0.67	22.04	473	1.50	82.6	20	507	<0.05	1.26	0.56	1,096	21.7	664	24	110
CD-586	7.24	0.66	1.318	0.86	19.32	566	0.50	50.3	35	597	<0.05	0.42	0.5	1,347	147	882	13	45
G-5193Z	7.05	0.41	0.839	0.55	20.69	448	0.55	19	15	456	0.06	0.58	0.7	828	6.1	484	22	110
NA-47	7.18	0.40	0.808	0.53	20.40	446	0.97	14.1	10	349	<0.05	0.88	0.67	799	<1.3	516	12	40
NA-47*	7.18	0.40	0.808	0.53	20.40	447	0.97	14.1	10	350	<0.05	1.01	0.7	801	<1.3	518	13.3	40
R-6675Z	7.34	0.41	0.84	0.55	20.47	474	0.64	10.6	45	466	0.06	0.69	0.67	849	2.1	498	18	65
RR-5095Z	7.15	1.31	2.524	1.64	20.59	<2	1.90	608	<5	101	<0.05	1.93	0.48	11,400	1,412	2,138	113	40

* Denotes duplicate sample.

Table 3-3 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	5	5	1	1	1	5	5	20	10	0.05	5	5	1	5	10
CD-431	<5	<5	543	<1	<1	<5	22.1	10,400	<10	<0.05	<5	<5	<1	<5	60.5
CD-586	<5	<5	204	<1	<1	<5	<5	5,790	<10	<0.05	<5	<5	<1	<5	<10
G-5193Z	<5	<5	488	<1	<1	<5	<5	10,300	<10	<0.05	<5	<5	<1	<5	<10
NA-47	<5	<5	412	<1	<1	<5	<5	5,500	<10	<0.05	<5	<5	<1	<5	24.2
NA-47*	<5	<5	423	<1	<1	<5	<5	5,650	<10	<0.05	<5	<5	<1	<5	26.7
R-6675Z	<5	<5	329	<1	<1	<5	24.9	31.2	<10	<0.05	<5	<5	<1	<5	20.1
RR-5095Z	<5	7.2	309	<1	<1	<5	<5	4,170	37.7	<0.05	<5	<5	<1	<5	307

* Denotes duplicate sample.

Table 3-4 Field, Water Quality, and Nutrients Statistics

Fiscal Year 2004

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	Temperature °C	19.32	22.04	20.56
	pH (SU)	7.05	7.39	7.22
	Sp. Conductance (mmhos/cm)	0.808	2.524	1.17
	Salinity (ppt)	0.4	1.31	0.59
	TDS (g/L)	0.525	1.641	0.76
LABORATORY	Alkalinity (ppm)	<2	566	408
	Chloride (ppm)	10.6	608	114.1
	Color (PCU)	<5	45	20
	Specific Conductance (umhos/cm)	799	11,400	2,445.7
	Sulfate (ppm)	<1.3	1,412	227.4
	TDS (ppm)	484	2,138	814.3
	TSS (ppm)	12	113	30.8
	Turbidity (NTU)	40	110	64.3
	Ammonia (ppm)	0.50	1.90	1.0
	Hardness (ppm)	101	597	403.7
	Nitrite-Nitrate, as N (ppm)	<0.05	0.06	<0.05
	TKN (ppm)	0.42	1.93	0.97
	Phosphorous (ppm)	0.48	0.7	0.61

Table 3-5 Inorganic Statistics

Fiscal Year 2004

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (ppb)	<5	<5	<5
Arsenic (ppb)	<5	7.2	5.31
Barium (ppb)	204	543	386.86
Beryllium (ppb)	<1	<1	<1
Cadmium (ppb)	<1	<1	<1
Chromium (ppb)	<5	<5	<5
Copper (ppb)	<5	24.9	10.3
Iron (ppb)	31.2	10,400	5,977.3
Lead (ppb)	10	37.7	14
Mercury (ppb)	<0.05	<0.05	<0.05
Nickel (ppb)	<5	<5	<5
Selenium (ppb)	<5	<5	<5
Silver (ppb)	<1	<1	<1
Thallium (ppb)	<5	<5	<5
Zinc (ppb)	<10	307	65.5

Table 3-6 Three-year Field, Water Quality, and Nutrients Averages

	PARAMETER	FY 1995 AVERAGE	FY 1998 AVERAGE	FY 2001 AVERAGE	FY 2004 AVERAGE	2004 W/O RR-5095Z DATA
FIELD	Temperature ^{O}C	21.00	19.88	20.50	20.56	20.55
	pH (SU)	6.67	6.81	7.64	7.22	7.22
	Sp. Conductance (mmhos/cm)	1.128	1.060	1.328	1.17	0.94
	Salinity (ppt)	0.54	0.53	0.67	0.59	0.47
	TDS (g/L)	-	-	-	0.76	0.61
LABORATORY	Alkalinity (ppm)	504.4	485.2	446.0	408	476
	Chloride (ppm)	45.3	42.8	163.4	114.1	31.8
	Color (PCU)	24.6	5.0	30.0	20	22.5
	Sp. Conductance (umhos/cm)	1099.8	1093.6	1398.2	2,445.7	953.3
	Sulfate (ppm)	69.3	62.2	52.1	227.4	29.9
	TDS (ppm)	716.0	699.2	817.6	814.3	593.7
	TSS (ppm)	18.8	13.6	12.5	30.8	17.1
	Turbidity (NTU)	56.0	54.4	44.7	64.3	68.3
	Ammonia (ppm)	1.27	0.54	0.88	1.0	0.86
	Hardness (ppm)	506.8	453.8	353.7	403.7	454.2
	Nitrite-Nitrate, as N (ppm)	<0.05	0.11	<0.05	<0.05	<0.05
	TKN (ppm)	4.96	0.95	1.05	0.97	0.81
	Phosphorus (ppm)	0.79	0.38	0.51	0.61	0.61

Table 3-7 Three-year Inorganic Averages

PARAMETER	FY 1995 AVERAGE	FY 1998 AVERAGE	FY 2001 AVERAGE	FY 2004 AVERAGE
Antimony (ppb)	<5	<5	<5	<5
Arsenic (ppb)	<10	<5	<5	5.31
Barium (ppb)	400.98	102.08	218.68	386.86
Beryllium (ppb)	<5	<5	<1	<1
Cadmium (ppb)	<5	<5	1.04	<1
Chromium (ppb)	12.4	<5	<5	<5
Copper (ppb)	19.9	968.7	<5	10.3
Iron (ppb)	6122.4	3339.5	3396.2	5,977.3
Lead (ppb)	32.3	<10	<10	14
Mercury (ppb)	<0.05	<0.05	<0.05	<0.05
Nickel (ppb)	10.4	1041.4	<5	<5
Selenium (ppb)	<5	<5	<5	<5
Silver (ppb)	<5	<5	1.0	<1
Thallium (ppb)	<5	<5	<2	<5
Zinc (ppb)	185.6	<10	41.7	65.5

Table 3-8 List of 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
Ethyl Benzene	624	100414	2
Methyl Bromide	624	74839	2
Methyl Chloride	624	74873	2
Methylene Chloride	624	75092	2
o-Xylene	624	95476	2
Styrene	624	100425	2
METHYL-t-BUTYL ETHER	624	1634044	2
Tetrachloroethylene	624	127184	2
Toluene	624	108883	2
TRANS-1,2-DICHLOROETHENE	624	156605	2
trans-1,3-Dichloropropene	624	10061026	2
Trichloroethylene	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 3-9 List of Semi-volatile Analytical Parameters
BASELINE MONITORING PROGRAM

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
1,2-Dichlorobenzene	8270C	95501	10
1,2,4-Trichlorobenzene	8270C	120821	10
1,3-Dichlorobenzene	8270C	541731	10
1,4-Dichlorobenzene	8270C	106467	10
2-Chloronaphthalene	8270C	91587	10
2-Chlorophenol	8270C	95578	10
2-Methyl-4,6-dinitrophenol	8270C	534521	25
2-Methylphenol	8270C	95487	10
2-Methylnaphthalene	8270C	91576	10
2-Nitroaniline	8270C	88744	25
2-Nitrophenol	8270C	88755	10
2,4-Dichlorophenol	8270C	120832	10
2,4-Dimethylphenol	8270C	105679	10
2,4-Dinitrophenol	8270C	51285	25
2,4-Dinitrotoluene	8270C	121142	10
2,4,5-Trichlorophenol	8270C	95954	25
2,4,6-Trichlorophenol	8270C	88062	10
2,6-Dinitrotoluene	8270C	606202	10
3,3'-Dichlorobenzidine	8270C	91941	20
3-Nitroaniline	8270C	99092	25
4-Bromophenyl phenyl ether	8270C	101553	10
4-Chloro-3-methylphenol	8270C	59507	10
4-Chloroaniline	8270C	106478	10
4-Chlorophenyl phenyl ether	8270C	7005723	10
4-Methylphenol	8270C	106445	10
4-Nitroaniline	8270C	100016	25
4-Nitrophenol	8270C	100027	25
Acenaphthene	8270C	83329	10
Acenaphthylene	8270C	208968	10
Anthracene	8270C	120127	10
Benzo[a]pyrene	8270C	50328	10
Benzo[k]fluoranthene	8270C	207089	10
Benz[a]anthracene	8270C	56553	10
Benzo[b]fluoranthene	8270C	205992	10
Benzo[g,h,i]perylene	8270C	191242	10
Benzoic acid	8270C	65850	25
Benzyl alcohol	8270C	100516	10
bis (2-Chloroethoxy) methane	8270C	111911	10
bis (2-Ethylhexyl) phthalate	8270C	117817	10
bis (2-Chloroethyl) ether	8270C	111444	10
bis (2-Chloroethyl) ether	8270C	111444	10
bis (2-Chloroisopropyl) ether	8270C	108601	10
Butyl benzyl phthalate	8270C	85687	10

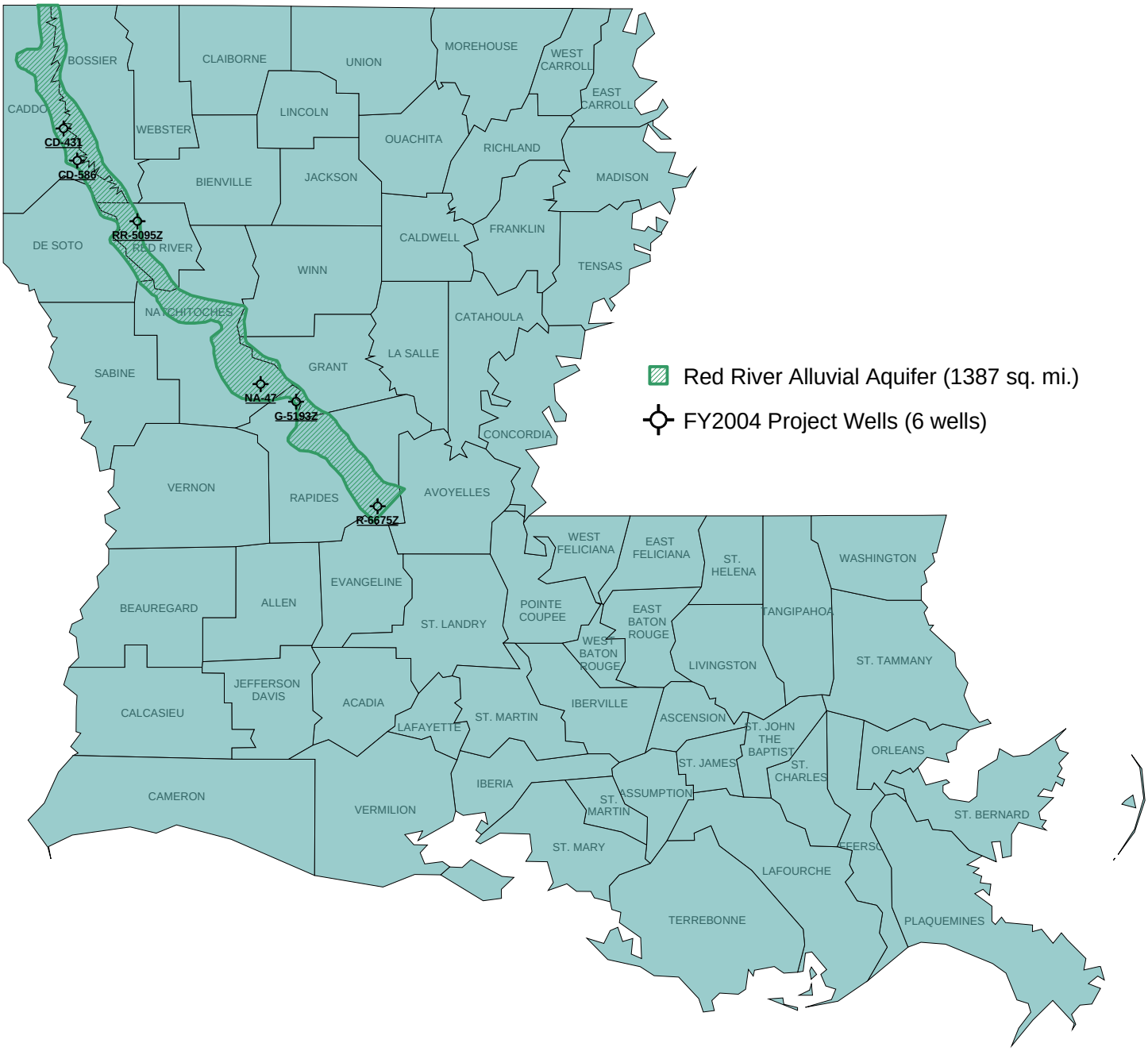
Table 3-9 (Cont'd)
Semivolatile Parameters

COMPOUND	ANALYTICAL METHOD	CAS NUMBER	PQL (ppb)
Chrysene	8270C	218019	10
Dibenzofuran	8270C	132649	10
Diethyl phthalate	8270C	84662	10
Dimethyl phthalate	8270C	131113	10
Di-n-butyl phthalate	8270C	84742	10
Di-n-octyl phthalate	8270C	117840	10
Fluoranthene	8270C	206440	10
Fluorene	8270C	86737	10
Hexachlorobenzene	8270C	118741	10
Hexachlorobutadiene	8270C	87683	10
Hexachlorocyclopentadiene	8270C	77474	10
Hexachloroethane	8270C	67721	10
Indeno[1,2,3-cd]pyrene	8270C	193395	10
Isophorone	8270C	78591	10
Naphthalene	8270C	91203	10
Nitrobenzene	8270C	98953	10
N-Nitrosodiphenylamine	8270C	86306	10
n-Nitrosodi-n-propylamine	8270C	621647	10
Pentachlorophenol	8270C	87865	25
Phenanthrene	8270C	85018	10
Phenol	8270C	108952	10
Pyrene	8270C	129000	10

Table 3-10 List of 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
Endrin ketone	8081	53494705	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 RED RIVER ALLUVIAL 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 3-1 Location Plat, Red River Alluvial Aquifer

RED RIVER ALLUVIAL AQUIFER - pH

Baseline Monitoring Program, FY2004

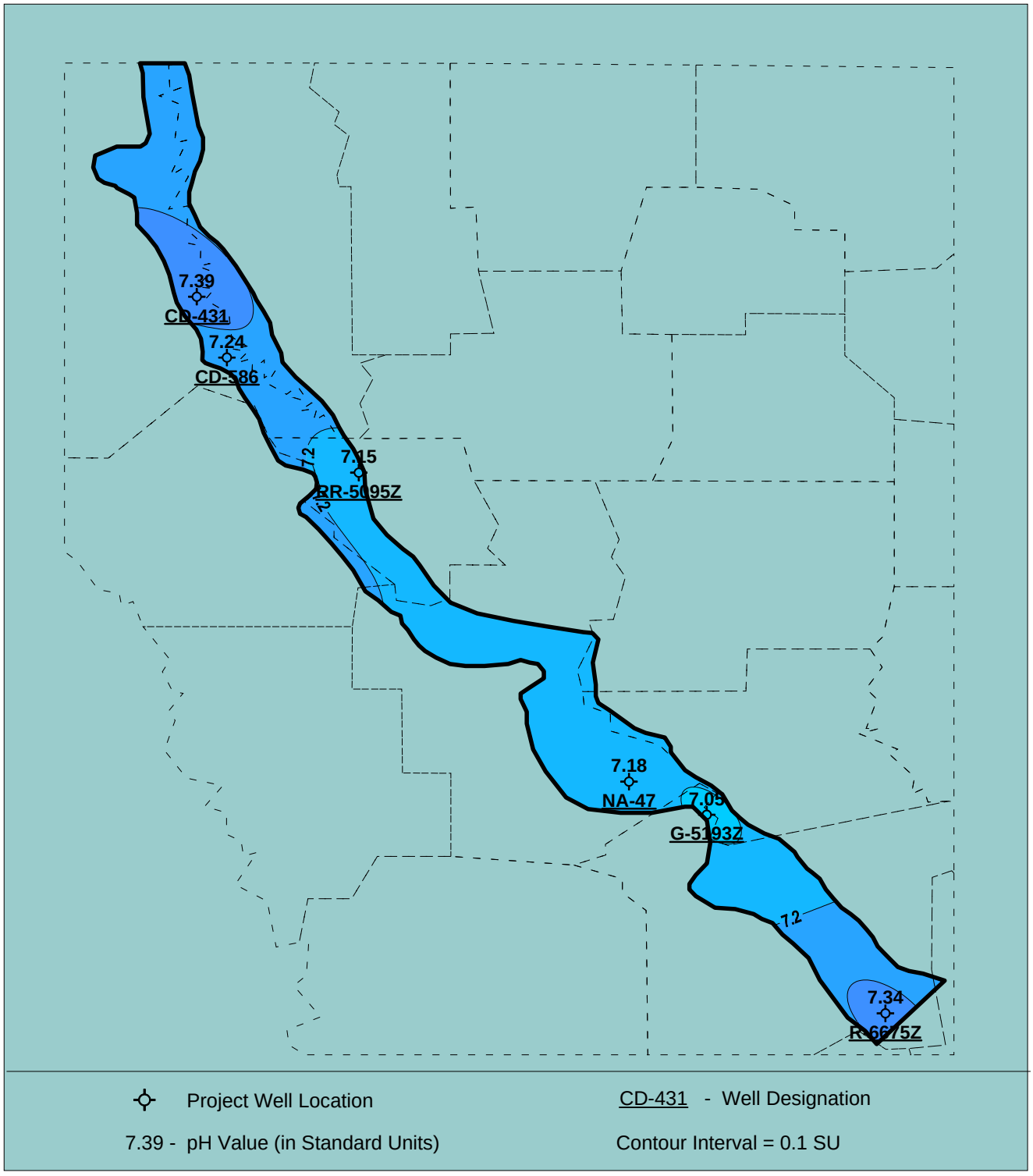


Figure 3-2 Map of pH Data

RED RIVER ALLUVIAL AQUIFER - TDS

Baseline Monitoring Program, FY2004

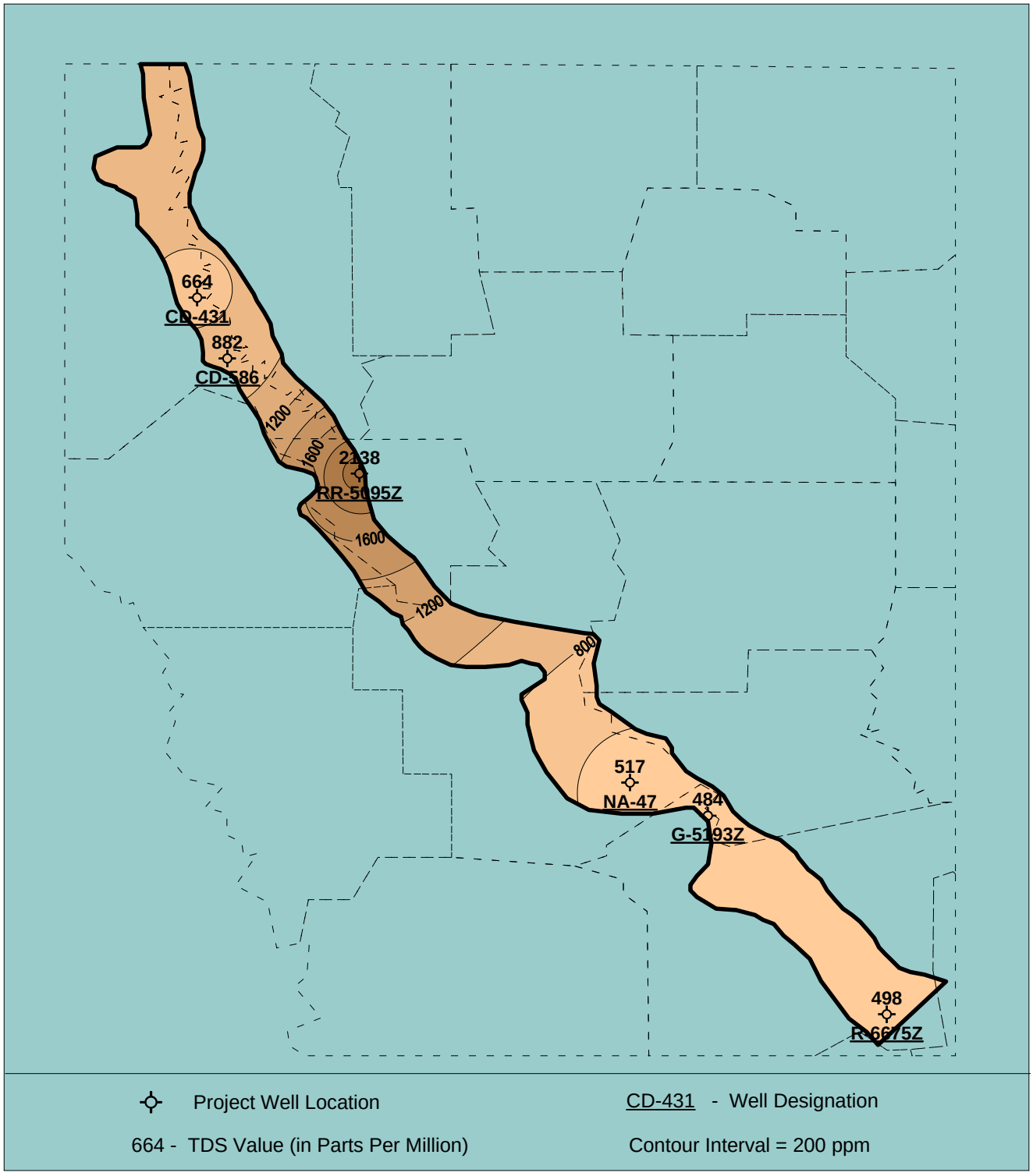


Figure 3-3 Map of TDS Data

RED RIVER ALLUVIAL AQUIFER - Chloride

Baseline Monitoring Program, FY2004

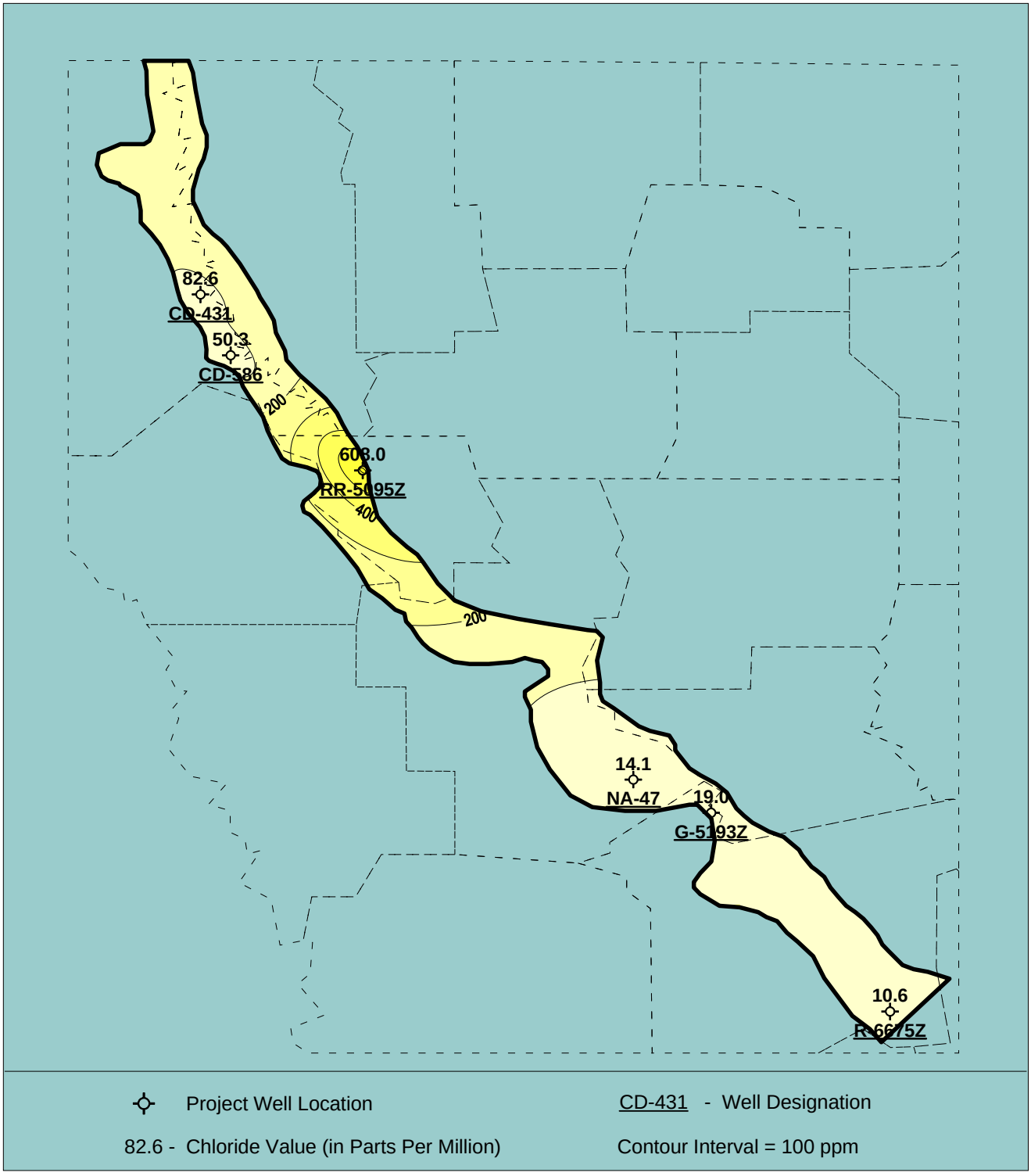


Figure 3-4 Map of Chloride Data