

CHICOT AQUIFER SUMMARY, 2017

AQUIFER SAMPLING AND ASSESSMENT PROGRAM



APPENDIX 10 TO THE 2018 TRIENNIAL SUMMARY REPORT
PARTIAL FUNDING PROVIDED BY THE CWA



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BACKGROUND

The Louisiana Department of Environmental Quality's (LDEQ) Aquifer Sampling and Assessment Program (ASSET) is an ambient monitoring program established to determine and monitor the quality of groundwater produced from Louisiana's major freshwater aquifers. The ASSET Program samples approximately 200 water wells located in 14 aquifers across the state. The sampling process is designed so that all 14 aquifers and associated wells are monitored every three years.

In order to better assess the water quality of a particular aquifer, an attempt is made to sample all ASSET Program wells producing from it in a narrow time frame. To more conveniently and economically promulgate those data collected, a summary report on each aquifer is prepared separately. Collectively, these aquifer summaries make up, in part, the ASSET Program's Triennial Summary Report for.

Analytical and field data contained in this summary were collected from wells producing from the Chicot aquifer during the 2017 state fiscal year (July 1, 2016 - June 30, 2017). This summary will become Appendix 10 of the ASSET Program Triennial Summary Report for 2018.

These data show that from April through June 2014, 22 wells were sampled which produce from the Chicot aquifer. Of these 22 wells, 10 are classified as public supply, four industrial, four domestic, two observation, and one each irrigation and recovery. The wells are located in 13 parishes in southwest Louisiana.

Figure 10-1 shows the geographic locations of the Chicot aquifer and the associated wells. Table 10-1 lists those wells and their corresponding parish, date sampled, owner, depth, and use classification.

Well data, including well location and aquifer assignment, for registered water wells were obtained from the Louisiana Department of Natural Resources water well registration data file.

GEOLOGY

The Chicot aquifer system consists of fining upward sequences of gravels, sands, silts, and clays of the Pleistocene Prairie, intermediate, and high terrace deposits of southwestern Louisiana. The medium to coarse-grained sand and gravel aquifer units dip and thicken toward the Gulf, thin slightly toward the west into Texas, and thicken toward the east where they are overlain by alluvium of the Atchafalaya and Mississippi rivers. The aquifers are confined, have a finer texture, and are increasingly subdivided by silts and clays southward from the northern limit of the outcrop area in southern Vernon and Rapides parishes.

In the Lake Charles area, the Chicot is divided into the shallow alluvial sands, the "200-foot" sand, the "500-foot" sand, and the "700-foot" sand. East of Calcasieu parish the Chicot is divided into the "upper sand" (in hydraulic connection to the Atchafalaya sand, Abbeville sand, and "200-foot" sand) and the "lower sand" ("700-foot" sand). The "500-foot" sand is largely isolated except where it merges with the "700-foot" sand north of Calcasieu Parish. Fresh water in the Chicot and other southwestern Louisiana aquifers is separated from fresh water in

southeast Louisiana by a saltwater ridge along the western edge of the Mississippi River valley. Salt water occurs within the Chicot along the coast and in isolated bodies north of the coast.

HYDROGEOLOGY

Recharge to the Chicot occurs primarily through the direct infiltration of rainfall in the interstream, upland outcrop-subcrop areas. Recharge also occurs by water movement from the Atchafalaya alluvium, downward infiltration through the clays south of the primary recharge outcrop area, upward movement from the underlying Evangeline aquifer, and inflow from the Vermilion and Calcasieu rivers. Water movement is generally toward the pumping centers at Lake Charles and Eunice. However, there is little movement of water from the west because of pumping in the Orange, Texas area. The hydraulic conductivity varies between 40-220 feet/day.

The maximum depths of occurrence of freshwater in the Chicot range from 100 feet above sea level, to 1,000 feet below sea level. The range of thickness of the fresh water interval in the Chicot is 50 to 1,050 feet. The depths of the Chicot wells that were monitored in conjunction with the ASSET Program range from 66 to 697 feet.

PROGRAM PARAMETERS

The field parameters checked at each ASSET Program well sampling site and the list of conventional parameters analyzed in the laboratory are shown in Table 10-2. The inorganic parameters analyzed in the laboratory are listed in Table 10-3. These tables also show the field and analytical results determined for each analyte. For quality control, duplicate samples were taken for each parameter from wells BE-488, LF-572, SL-7152Z, and SMN-109.

In addition to the field, conventional and inorganic analytical parameters, the target analyte list includes three other categories of compounds: volatiles, semi-volatiles, and pesticides/PCBs. Due to the large number of analytes in these categories, tables were not prepared showing the analytical results for these compounds. A discussion of any detections from any of these three categories, if necessary, can be found in their respective sections. Tables 10-8, 10-9 and 10-10 list the target analytes for volatiles, semi-volatiles and pesticides/PCBs, respectively.

Tables 10-4 and 10-5 provide a statistical overview of field and conventional data, and inorganic data for the Chicot aquifer, listing the minimum, maximum, and average results for these parameters collected in the FY 2017 sampling. Tables 10-6 and 10-7 compare these same parameter averages to historical ASSET derived data for the Chicot aquifer, from fiscal years 1996, 1999, 2002, 2005, 2008, 2011, and 2014.

The average values listed in the above referenced tables are determined using all valid, reported results, including those reported as non-detect, or less than the detection limit (< DL). Per Departmental policy concerning statistical analysis, one-half the DL is used in place of zero when non-detects are encountered. However, the minimum value is reported < DL, not one-half the DL. If all values for a particular analyte are reported as < DL, then the minimum, maximum, and average values are all reported as < DL.

Due to the variability in the laboratory's reporting detection limits caused by dilution factors, whenever an analyte in question is not detected, the standard reporting detection limit value for each analytical method is used as the DL when performing statistical calculations.

Charts 10-1 through 10-18 represent the trend of the graphed parameter, based on the averaged value of that parameter for each three-year reporting period. Discussion of historical data and related trends is found in the **Water Quality Trends and Comparison to Historical ASSET Data** section.

INTERPRETATION OF DATA

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, the ASSET Program uses the MCLs as a benchmark for further evaluation.

EPA has set secondary standards, which are defined as non-enforceable taste, odor, or appearance guidelines. Field and laboratory data contained in Tables 10-2 and 10-3 show that one or more secondary MCL (SMCL) was exceeded in 20 of the 22 wells sampled in the Chicot aquifer.

Field and Conventional Parameters

Table 10-2 shows the field and conventional parameters for which samples are collected at each well and the analytical results for those parameters. Table 10-4 provides an overview of this data for the Chicot aquifer, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards: A review of the analysis listed in Table 10-2 shows that no MCL was exceeded for field or conventional parameters for this reporting period.

ASSET wells reporting turbidity levels greater than 1.0 NTU do not exceed the Primary MCL of 1.0, as this standard applies to public supply water wells that are under the direct influence of surface water. The Louisiana Department of Health has determined that no public water supply well in Louisiana was in this category.

Federal Secondary Drinking Water Standards: A review of the analysis listed in Table 10-2 shows that one well exceeded the SMCL for chloride, four wells exceeded the SMCL for pH, 11 wells exceeded the SMCL for color, and five wells exceeded the SMCL for total dissolved solids. Laboratory results override field results in exceedance determination, thus only laboratory results will be counted in determining SMCL exceedance numbers. Following is a list of SMCL parameter exceedances with well number and results:

pH (SMCL = 6.5 – 8.5 SU):

BE-412	6.17 SU
BE-488	6.44 SU (Original and Duplicate)
CU-1366	6.18 SU
V-535	5.35 SU

Chloride (SMCL = 250 mg/L):

CN-92	366.0 mg/L
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Color (SMCL = 15 PCU):

AC-539	55 PCU	
AC-8316Z	55 PCU	
CU-1366	45 PCU	
EV-673	30 PCU	
I-7312Z	30 PCU	
LF-572	25 PCU, Duplicate	30 PCU
SL-7152Z	30 PCU, Duplicate	20 PCU
VE-151	40 PCU	
VE-862	35 PCU	
VE-882	45 PCU	
VE VIATOR	55 PCU	

Total Dissolved Solids (SMCL = 500 mg/L or 0.5 g/L):

	<u>LAB RESULTS (in mg/L)</u>	<u>FIELD MEASURES (in g/L)</u>
CN-92	905 mg/L	1.138 g/L
JD-862	550 mg/L	0.605 g/L
SMN-109	705 mg/L, (Duplicate 685 mg/L)	0.848 g/L, (Duplicate 0.848 g/L)
VE-862	630 mg/L	0.742 g/L
VE-882	510 mg/L	0.546 g/L

Inorganic Parameters

Table 10-3 shows the inorganic (total metals) parameters for which samples are collected at each well and the analytical results for those parameters. Table 10-5 provides an overview of this data for the Chicot aquifer, listing the minimum, maximum, and average results for these parameters.

Federal Primary Drinking Water Standards: A review of the analyses listed on Table 10-3 shows that no MCL was exceeded or inorganics.

Federal Secondary Drinking Water Standards: Laboratory data contained in Table 10-3 shows that 16 of the 22 wells sampled exceeded the secondary MCL (SMCL) for iron as shown in the following list:

Iron (SMCL = 300 µg/L):

AC-539	1660 µg/L		
AC-8316Z	2390 µg/L		
BE-378	2320 µg/L		
CU-862	1710 µg/L		
CU-1366	1650 µg/L		
CU-1471	1080 µg/L		
EV-673	780 µg/L		
I-7312Z	904 µg/L		
JD-862	2340 µg/L		
LF-572	741 µg/L	Duplicate	745 µg/L
SL-7152Z	883 µg/L	Duplicate	918 µg/L
SMN-109	1200 µg/L	Duplicate	1210 µg/L
VE-151	3480 µg/L		
VE-862	908 µg/L		
VE-882	1270 µg/L		
VE-VIATOR	2760 µg/L		

Volatile Organic Compounds

Table 10-8 shows the volatile organic compound (VOC) parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a VOC would be discussed in this section.

Analytical results show that industrial recovery well CU-10192Z had detections of two volatile organic compounds at low concentrations. Bromoform and bromodichloromethane were detected at 0.75 µg/L and 2.6 µg/L respectively. Neither of these organic compounds have primary or secondary drinking limits established for them.

There were no other confirmed detections of VOCs at or above their respective detection limits during the FY 2017 sampling of the Chicot aquifer.

Semi-Volatile Organic Compounds

Table 10-9 shows the semi-volatile organic compound (SVOC) parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a SVOC would be discussed in this section.

Results show that industrial use well AN-500 reported the semi-volatile organic compound, bis(2-chloroethyl) ether, at 274 µg/L. There are no primary or secondary drinking water limits established for this compound, however close attention will be given this well in subsequent sampling.

There were no other confirmed detections of SVOCs at or above their respective detection limits during the FY 2017 sampling of the Chicot aquifer.

Pesticides and PCBs

Table 10-10 shows the pesticide and PCB parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a pesticide or PCB would be discussed in this section.

There were no confirmed detections of pesticides or PCBs at or above their respective detection limits during the FY 2017 sampling of the Chicot aquifer.

WATER QUALITY TRENDS AND COMPARISON TO HISTORICAL ASSET DATA

Analytical and field data show that the quality and characteristics of ground water produced from the Chicot aquifer exhibit some changes when comparing current data to that of the seven previous sampling rotations. These comparisons are in Tables 10-6 and 10-7, and in Charts 10-1 to 10-18 of this summary. Increasing or decreasing trend statements made here are based on an R-square value (slope) of 0.03 or greater. An R-square value of less than 0.03 is considered to have only a slight or no change.

Over the 21-year period, 10 analytes have shown general increases in average concentrations, while seven have shown general decreases. Analytes exhibiting increases are: alkalinity, ammonia, barium, chloride, color, hardness, salinity, specific conductance (field and lab), total dissolved solids (field and lab), and total Kjeldahl nitrogen. Analytes exhibiting decreases are: copper, iron, nitrite-nitrate, sulfate, temperature, total phosphorus, and zinc. All other analyte averages have remained consistent or have been non-detect for this period. The number of secondary exceedances in the Chicot aquifer has increased from the previous sampling in FY 2014 from 26 SMCL exceedances, to 37 in FY 2017.

SUMMARY AND RECOMMENDATIONS

In summary, the data show that the ground water produced from this aquifer is hard¹ and is of good quality when considering short-term or long-term health risk guidelines, in that no ASSET well sampled during the Fiscal Year 2017 monitoring of the Chicot aquifer exceeded a primary MCL. The data also show that this aquifer is of poor quality when considering taste, odor, or appearance guidelines, due to the number of wells (20) with SMCL exceedances.

Comparison to historical ASSET-derived data shows some change in the quality or characteristics of the Chicot aquifer, with 10 parameters showing increases in average concentrations and seven parameters showing decreases in average concentrations. The remainder of the parameter averages has continued to be consistent over the previous eighteen-year period.

It is recommended that the wells assigned to the Chicot aquifer be re-sampled as planned, in approximately three years, with special attention given to well AN-500 and the reported occurrence of bis(2-chloroethyl) ether. In addition, several wells should be added to the 22 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*. New York: McGraw-Hill, 1985.

Table 10-1: List of Wells Sampled, Chicot Aquifer – FY 2017

Well ID	Parish	Date	Owner	Depth (Feet)	Well Use
AC-539	Acadia	6/27/2017	City Of Rayne	251	Public Supply
AC-8316Z	Acadia	6/27/2017	Private Owner	165	Domestic
BE-378	Beauregard	5/24/2017	Transcontinental Gas Pipeline	172	Industrial
BE-412	Beauregard	5/24/2017	Boise - Deridder	202	Industrial
BE-488	Beauregard	5/24/2017	Singer Water District	262	Public Supply
CN-92	Cameron	4/6/2017	USGS	443	Observation
CU-10192Z	Calcasieu	5/23/2017	Axiall	230	Recovery
CU-1366	Calcasieu	6/27/2017	City Of Lake Charles	685	Public Supply
CU-1471	Calcasieu	5/23/2017	Axiall	525	Industrial
CU-862	Calcasieu	5/23/2017	Citgo Petroleum Corporation	560	Industrial
EV-673	Evangeline	6/20/2017	City Of Mamou	247	Public Supply
I-7312Z	Iberia	6/21/2017	Breaux Electric	180	Public Supply
JD-862	Jefferson Davis	5/23/2017	City Of Welsh	697	Public Supply
LF-572	Lafayette	6/27/2017	LUS	570	Public Supply
R-6947Z	Rapides	6/20/2017	Private Owner	110	Domestic
SL-7152Z	St. Landry	6/21/2017	Private Owner	180	Domestic
SMN-109	St. Martin	4/5/2017	USGS	375	Observation
V-535	Vernon	6/20/2017	Marlow Fire Station	66	Public Supply
VE-151	Vermilion	6/28/2017	Vermilion Oaks Country Club	250	Irrigation
VE-862	Vermilion	6/28/2017	Town of Gueydan	249	Public Supply
VE-882	Vermilion	6/28/2017	City of Kaplan	279	Public Supply
VE-VIATOR	Vermilion	6/28/2017	Private Owner	200	Domestic

Table 10-2: Summary of Field and Conventional Data, Chicot Aquifer – FY 2017

Well ID	pH	Sal ppt	Sp Cond mmhos/cm	Temp Deg C	TDS g/L	Alk mg/L	Cl mg/L	Color PCU	Hard mg/L	Nitrite-Nitrate (as N) mg/L	NH3 mg/L	Tot P mg/L	Sp Cond µmhos/cm	SO4 mg/L	TDS mg/L	TKN mg/L	TSS mg/L	Turb NTU
	Laboratory Reporting Limits →					2	1	5	5	0.05	0.1	0.05	1	1	10	0.1	4	0.1
	Field Parameters					Laboratory Parameters												
AC-539	7.38	0.32	0.646	19.16	0.420	354	27.6	55	216	< DL	1.20	0.22	674	< DL	390	1.50	< DL	12.3
AC-8316Z	6.94	0.41	0.841	19.03	0.547	397	71.0	55	250	< DL	1.10	0.25	873	12.6	460	1.20	7	21.2
BE-378	7.47	0.16	0.339	18.91	0.220	118	42.4	< DL	78	< DL	< DL	0.28	335	3.0	220	< DL	< DL	0.8
BE-412	6.17	0.03	0.058	17.45	0.038	22	6.7	< DL	8	0.07	< DL	< DL	55	< DL	85	< DL	< DL	0.3
BE-488	6.44	0.04	0.077	18.15	0.050	30	6.8	< DL	22	< DL	< DL	< DL	75	< DL	70	< DL	< DL	0.6
BE-488*	6.44	0.04	0.077	18.15	0.050	31	6.9	< DL	14	< DL	< DL	< DL	75	< DL	50	< DL	< DL	0.3
CN-92	7.75	0.89	1.750	20.40	1.138	246	366.0	< DL	172	< DL	0.57	< DL	1580	< DL	905	0.99	< DL	1.5
CU-10192Z	7.21	0.20	0.411	19.50	0.268	246	42.1	< DL	136	< DL	< DL	< DL	518	1.8	285	< DL	< DL	1.0
CU-1366	6.18	0.34	0.695	20.91	0.452	168	133.0	45	122	< DL	< DL	0.21	765	< DL	360	< DL	< DL	17.5
CU-1471	6.55	0.20	0.411	21.27	0.267	187	34.4	5	126	< DL	0.20	0.16	428	< DL	195	0.45	< DL	4.9
CU-862	7.15	0.39	0.802	21.19	0.521	197	141.0	5	224	< DL	0.16	< DL	774	< DL	490	< DL	4	15.5
EV-673	6.50	0.37	0.754	18.61	0.490	300	76.8	30	148	< DL	0.21	0.27	181	< DL	425	0.21	< DL	4.7
I-7312Z	7.18	0.22	0.450	19.29	0.293	268	6.2	30	200	0.24	0.15	0.22	534	< DL	285	< DL	< DL	6.4
JD-862	7.11	0.46	0.930	21.24	0.605	157	197.0	5	156	< DL	0.35	0.17	957	< DL	550	0.11	< DL	18.1
LF-572	7.23	0.19	0.393	17.88	0.256	225	7.2	25	200	< DL	0.14	0.25	427	4.7	255	0.71	< DL	6.6
LF-572*	7.23	0.19	0.393	17.88	0.256	214	7.1	30	200	< DL	0.12	0.27	430	4.7	285	0.25	< DL	7.6
R-6947Z	6.56	0.03	0.056	17.52	0.036	17	5.9	10	8	0.28	< DL	< DL	61	1.5	50	< DL	< 4.0	0.3
SL-7152Z	7.36	0.18	0.382	18.61	0.248	236	5.6	30	170	< DL	0.94	0.34	395	< DL	250	0.83	< DL	5.8
SL-7152Z*	7.36	0.18	0.382	18.61	0.248	214	5.6	20	172	< DL	0.91	0.40	394	< DL	235	0.82	< DL	5.8
SMN-109	7.22	0.65	1.304	19.50	0.848	420	148.0	< DL	300	< DL	0.91	0.20	1190	< DL	705	1.10	< DL	12.9
SMN-109*	7.22	0.65	1.304	19.50	0.848	420	148.0	< DL	280	< DL	0.90	0.15	1260	< DL	685	1.30	< DL	11.4
V-535	5.35	0.01	0.028	18.89	0.018	6	3.3	10	< DL	0.05	< DL	< DL	27	< DL	65	< DL	< DL	0.4
VE-151	7.77	0.49	0.987	19.24	0.642	440	104.0	40	316	< DL	0.62	0.31	1030	2.7	490	0.55	7	32.2
VE-862	7.65	0.57	1.141	19.50	0.742	429	136.0	35	246	< DL	2.20	0.20	1180	< DL	630	2.00	< DL	4.9
VE-882	7.55	0.41	0.841	18.57	0.546	472	56.6	45	226	< DL	1.10	0.25	872	< DL	510	0.82	< DL	5.5
VE-VIATOR	7.59	0.24	0.486	19.20	0.316	300	10.8	55	202	< DL	1.40	0.39	511	< DL	300	1.00	< DL	22.4

*Duplicate Sample

Shaded cells exceed EPA Secondary Standards

Table 10-3: Summary of Inorganic Data, Chicot Aquifer – FY 2017

Well ID	Antimony ug/L	Arsenic ug/L	Barium ug/L	Beryllium ug/L	Cadmium ug/L	Chromium ug/L	Copper ug/L	Iron ug/L	Lead ug/L	Mercury ug/L	Nickel ug/L	Selenium ug/L	Silver ug/L	Thallium ug/L	Zinc ug/L	
Laboratory Reporting Limits	1	1	1	0.5	1	1	2	100	1	0.2	2	5	1	2	5	
AC-539	< DL	< DL	541	< DL	< DL	< DL	< DL	1660	< DL	< DL	< DL	< DL	< DL	< DL	< DL	6.7
AC-8316Z	< DL	< DL	522	< DL	< DL	< DL	< DL	2390	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
BE-378	< DL	1.4	121	< DL	< DL	< DL	20.3	2320	3.0	< DL	< DL	< DL	< DL	< DL	< DL	25.8
BE-412	< DL	< DL	94.6	< DL	< DL	1.0	< DL	< DL	< DL	< DL	1.0	< DL	< DL	< DL	< DL	< DL
BE-488	< DL	< DL	70.4	< DL	< DL	< DL	< DL	< DL	< DL	< DL	1.6	< DL	< DL	< DL	< DL	10.7
BE-488*	< DL	< DL	72.2	< DL	< DL	< DL	< DL	< DL	< DL	< DL	1.6	< DL	< DL	< DL	< DL	9.2
CN-92	< DL	< DL	860	< DL	< DL	< DL	< DL	179	< DL	< DL	< DL	< DL	< DL	< DL	< DL	104.0
CU-10192Z	< DL	< DL	248	< DL	< DL	< DL	< DL	138	< DL	< DL	< DL	< DL	< DL	< DL	< DL	162.0
CU-1366	< DL	< DL	330	< DL	< DL	< DL	< DL	1650	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CU-1471	< DL	< DL	218	< DL	< DL	< DL	< DL	1080	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
CU-862	< DL	< DL	471	< DL	< DL	< DL	< DL	1710	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
EV-673	< DL	3.0	274	< DL	< DL	< DL	< DL	780	< DL	< DL	< DL	< DL	< DL	< DL	< DL	6.2
I-7312Z	< DL	1.4	167	< DL	< DL	< DL	< DL	904	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
JD-862	< DL	< DL	765	< DL	< DL	< DL	< DL	2340	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
LF-572	< DL	< DL	204	< DL	< DL	< DL	< DL	741	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
LF-572*	< DL	< DL	210	< DL	< DL	< DL	< DL	745	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
R-6947Z	< DL	< DL	45	< DL	< DL	< DL	6.3	< DL	< DL	< DL	1.5	< DL	< DL	< DL	< DL	< DL
SL-7152Z	< DL	< DL	138	< DL	< DL	< DL	< DL	883	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
SL-7152Z*	< DL	< DL	141	< DL	< DL	< DL	< DL	918	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
SMN-109	< DL	< DL	795	< DL	< DL	< DL	< DL	1200	< DL	< DL	< DL	< DL	< DL	< DL	< DL	385.0
SMN-109*	< DL	< DL	778	< DL	< DL	< DL	< DL	1210	1.5	< DL	< DL	< DL	< DL	< DL	< DL	365.0
V-535	< DL	< DL	28	< DL	< DL	< DL	36.2	113	1.4	< DL	< DL	< DL	< DL	< DL	< DL	18.7
VE-151	< DL	2.4	336	< DL	< DL	< DL	< DL	3480	< DL	< DL	< DL	< DL	< DL	< DL	< DL	14.8
VE-862	< DL	< DL	938	< DL	< DL	< DL	< DL	908	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
VE-882	< DL	< DL	582	< DL	< DL	< DL	< DL	1270	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
VE-VIATOR	< DL	7.3	130	< DL	< DL	< DL	< DL	2760	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL

*Duplicate Sample

Exceed EPA Secondary Standards

Table 10-4: Field and Conventional Statistics, FY 2017 ASSET Wells

	PARAMETER	MINIMUM	MAXIMUM	AVERAGE
FIELD	pH (SU)	5.35	7.77	7.02
	Salinity (ppt)	0.01	0.89	0.30
	Specific Conductance (mmhos/cm)	0.028	1.750	0.613
	Temperature (°C)	17.45	21.27	19.16
	Total Dissolved Solids (g/L)	0.018	1.138	0.399
LABORATORY	Alkalinity (mg/L)	6	472	235
	Chloride (mg/L)	3.3	366.0	69.1
	Color (PCU)	< DL	55	21
	Hardness (mg/L)	< DL	316	161
	Nitrite - Nitrate, as N (mg/L)	< DL	0.28	< DL
	Ammonia, as N (mg/L)	< DL	2.20	0.52
	Total Phosphorus (mg/L)	< DL	0.40	0.18
	Specific Conductance (µmhos/cm)	27	1580	600
	Sulfate (mg/L)	< DL	12.6	1.6
	Total Dissolved Solids (mg/L)	50	905	355
	Total Kjeldahl Nitrogen (mg/L)	< DL	2.00	0.55
	Total Suspended Solids (mg/L)	< DL	7	< DL
	Turbidity (NTU)	0.3	32.2	8.5

Table 10-5: Inorganic Statistics, FY 2017 ASSET Wells

PARAMETER	MINIMUM	MAXIMUM	AVERAGE
Antimony (µg/L)	< DL	< DL	< DL
Arsenic (µg/L)	< DL	7.3	1.0
Barium (µg/L)	28.1	938.0	349.2
Beryllium (µg/L)	< DL	< DL	< DL
Cadmium (µg/L)	< DL	< DL	< DL
Chromium (µg/L)	< DL	1.0	< DL
Copper (µg/L)	< DL	36.2	3.7
Iron (µg/L)	< DL	3480	1134
Lead (µg/L)	< DL	3.0	< DL
Mercury (µg/L)	< DL	< DL	< DL
Nickel (µg/L)	< DL	1.6	< DL
Selenium (µg/L)	< DL	< DL	< DL
Silver (µg/L)	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL
Zinc (µg/L)	< DL	385.0	44.0

Table 10-6: Triennial Field and Conventional Statistics, ASSET Wells

PARAMETER		AVERAGE VALUES BY FISCAL YEAR							
		FY 1996	FY 1999	FY 2002	FY 2005	FY 2008	FY 2011	FY 2014	FY 2017
FIELD	pH (SU)	7.08	7.01	7.03	7.22	7.33	7.28	7.12	7.02
	Salinity (ppt)	0.26	0.33	0.25	0.27	0.31	0.30	0.29	0.30
	Specific Conductance (mmhos/cm)	0.534	0.650	0.5230	0.540	0.630	0.610	0.585	0.613
	Temperature (OC)	22.68	23.20	21.85	22.38	22.47	20.91	22.34	19.16
	Total Dissolved Solids (g/L)	-	-	-	0.350	0.400	0.400	0.381	0.399
LABORATORY	Alkalinity (mg/L)	200	189	193	190	216	210	182	235
	Chloride (mg/L)	67.5	59.6	51.6	59.7	85.9	67.7	75.6	69.1
	Color (PCU)	22	13	14	13	24	9	6	21
	Hardness (mg/L)	130	123	127	133	162	162	123	161
	Nitrite - Nitrate, as N (mg/L)	< DL	< DL	< DL	< DL	< DL	< DL	0.02	< DL
	Ammonia, as N (mg/L)	0.36	0.35	0.41	0.32	0.36	0.40	0.37	0.52
	Total Phosphorus (mg/L)	0.24	0.25	0.13	0.23	0.21	0.20	0.24	0.18
	Specific Conductance (µmhos/cm)	594	552	502	539	660	571	607	600
	Sulfate (mg/L)	2.1	2.8	1.5	2.0	2.8	3.3	2.3	1.6
	Total Dissolved Solids (mg/L)	369	352	302	322	384	370	387	355
	Total Kjeldahl Nitrogen (mg/L)	0.35	0.67	0.58	0.50	0.43	0.63	0.53	0.55
	Total Suspended Solids (mg/L)	20	5	4	18	4	7	< DL	< DL
	Turbidity (NTU)	13.8	14.6	13.8	16.2	20.8	12.3	5.4	8.5

Table 10-7: Triennial Inorganic Statistics, ASSET Wells

PARAMETER	AVERAGE VALUES BY FISCAL YEAR							
	FY 1996	FY 1999	FY 2002	FY 2005	FY 2008	FY 2011	FY 2014	FY 2017
Antimony (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Arsenic (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	1.0
Barium (µg/L)	277.6	312.0	297.0	359.0	389.8	326.9	364	349.2
Beryllium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Cadmium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Chromium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Copper (µg/L)	14.4	35.8	25.7	42.2	7.2	4.8	3.1	3.7
Iron (µg/L)	1824	1971	1795	3074	2238	1432	1115	1134
Lead (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Mercury (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Nickel (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Selenium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Silver (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Thallium (µg/L)	< DL	< DL	< DL	< DL	< DL	< DL	< DL	< DL
Zinc (µg/L)	346.7	152.3	123.5	620.7	105.0	123.4	41.3	44.0



Table 10-8: Volatile Organic Compound List

VOC ANALYTICAL PARAMETERS	METHOD	REPORTING LIMIT (µg/L)
1,1,1-TRICHLOROETHANE	624	0.50
1,1,2,2-TETRACHLOROETHANE	624	0.50
1,1,2-TRICHLOROETHANE	624	0.50
1,1-DICHLOROETHANE	624	0.50
1,1-DICHLOROETHENE	624	0.50
1,2-DICHLOROBENZENE	624	0.50
1,2-DICHLOROETHANE	624	0.50
1,2-DICHLOROPROPANE	624	0.50
1,3-DICHLOROBENZENE	624	0.50
1,4-DICHLOROBENZENE	624	0.50
BENZENE	624	0.50
BROMODICHLOROMETHANE	624	0.50
BROMOFORM	624	0.50
BROMOMETHANE	624	1.0
CARBON TETRACHLORIDE	624	0.50
CHLOROBENZENE	624	0.50
CHLOROETHANE	624	0.50
CHLOROFORM	624	0.50
CHLOROMETHANE	624	1.0
CIS-1,3-DICHLOROPROPENE	624	1.0
DIBROMOCHLOROMETHANE	624	0.50
ETHYL BENZENE	624	0.50
METHYLENE CHLORIDE	624	1.0
O-XYLENE (1,2-DIMETHYLBENZENE)	624	0.50
STYRENE	624	0.50
TERT-BUTYL METHYL ETHER	624	0.50
TETRACHLOROETHYLENE (PCE)	624	0.50
TOLUENE	624	0.50
TRANS-1,2-DICHLOROETHENE	624	0.50
TRANS-1,3-DICHLOROPROPENE	624	0.50
TRICHLOROETHYLENE (TCE)	624	0.50
TRICHLOROFLUOROMETHANE (FREON-11)	624	0.50
VINYL CHLORIDE	624	0.50
XYLENES, M & P	624	1.0

Table 10-9: Semi-Volatile Organic Compound List

SVOC ANALYTICAL PARAMETERS	METHOD	REPORTING LIMIT (µg/L)
1,2,4-TRICHLOROBENZENE	625	5.0
2,4,6-TRICHLOROPHENOL	625	5.0
2,4-DICHLOROPHENOL	625	5.0
2,4-DIMETHYLPHENOL	625	5.0
2,4-DINITROPHENOL	625	20.0
2,4-DINITROTOLUENE	625	5.0
2,6-DINITROTOLUENE	625	5.0
2-CHLORONAPHTHALENE	625	5.0
2-CHLOROPHENOL	625	5.0
2-NITROPHENOL	625	5.0
3,3'-DICHLOROBENZIDINE	625	5.0
4,6-DINITRO-2-METHYLPHENOL	625	10.0
4-BROMOPHENYL PHENYL ETHER	625	5.0
4-CHLORO-3-METHYLPHENOL	625	5.0
4-CHLOROPHENYL PHENYL ETHER	625	5.0
4-NITROPHENOL	625	20.0
ACENAPHTHENE	625	0.20
ACENAPHTHYLENE	625	0.20
ANTHRACENE	625	0.20
BENZIDINE	625	20.0
BENZO(A)ANTHRACENE	625	0.20
BENZO(A)PYRENE	625	0.20
BENZO(B)FLUORANTHENE	625	0.20
BENZO(G,H,I)PERYLENE	625	0.20
BENZO(K)FLUORANTHENE	625	0.20
BENZYL BUTYL PHTHALATE	625	5.0
BIS(2-CHLOROETHOXY) METHANE	625	5.0
BIS(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	625	5.0
BIS(2-ETHYLHEXYL) PHTHALATE	625	5.0
CHRYSENE	625	0.20
DIBENZ(A,H)ANTHRACENE	625	0.20
DIETHYL PHTHALATE	625	5.0
DIMETHYL PHTHALATE	625	5.0
DI-N-BUTYL PHTHALATE	625	5.0
DI-N-OCTYLPHTHALATE	625	5.0
FLUORANTHENE	625	0.20
FLUORENE	625	0.20

SVOC ANALYTICAL PARAMETERS	METHOD	REPORTING LIMIT (µg/L)
HEXACHLOROBENZENE	625	5.0
HEXACHLOROBUTADIENE	625	5.0
HEXACHLOROCYCLOPENTADIENE	625	10.0
HEXACHLOROETHANE	625	5.0
INDENO(1,2,3-C,D)PYRENE	625	0.20
ISOPHORONE	625	5.0
NAPHTHALENE	625	0.20
NITROBENZENE	625	5.0
N-NITROSODIMETHYLAMINE	625	5.0
N-NITROSODI-N-PROPYLAMINE	625	5.0
N-NITROSODIPHENYLAMINE	625	5.0
PENTACHLOROPHENOL	625	5.00
PHENANTHRENE	625	0.20
PHENOL	625	5.0
PYRENE	625	0.20

Table 10-10: Pesticide and PCB List

Pest/PCB Analytical Parameters	METHOD	REPORTING LIMIT (µg/L)
ALDRIN	608	0.025
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	608	0.025
ALPHA ENDOSULFAN	608	0.025
ALPHA-CHLORDANE	608	0.025
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	608	0.025
BETA ENDOSULFAN	608	0.025
CHLORDANE	608	0.20
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	608	0.025
DIELDRIN	608	0.025
ENDOSULFAN SULFATE	608	0.025
ENDRIN	608	0.025
ENDRIN ALDEHYDE	608	0.025
ENDRIN KETONE	608	0.025
GAMMA-CHLORDANE	608	0.025
HEPTACHLOR	608	0.025
HEPTACHLOR EPOXIDE	608	0.025
METHOXYCHLOR	608	0.25
P,P'-DDD	608	0.025
P,P'-DDE	608	0.025
P,P'-DDT	608	0.025
PCB-1016 (AROCHLOR 1016)	608	0.80
PCB-1221 (AROCHLOR 1221)	608	0.80
PCB-1232 (AROCHLOR 1232)	608	0.80
PCB-1242 (AROCHLOR 1242)	608	0.80
PCB-1248 (AROCHLOR 1248)	608	0.80
PCB-1254 (AROCHLOR 1254)	608	0.80
PCB-1260 (AROCHLOR 1260)	608	0.80
TOXAPHENE	608	1.0

Figure 10-1: Location Plat, Chicot Aquifer

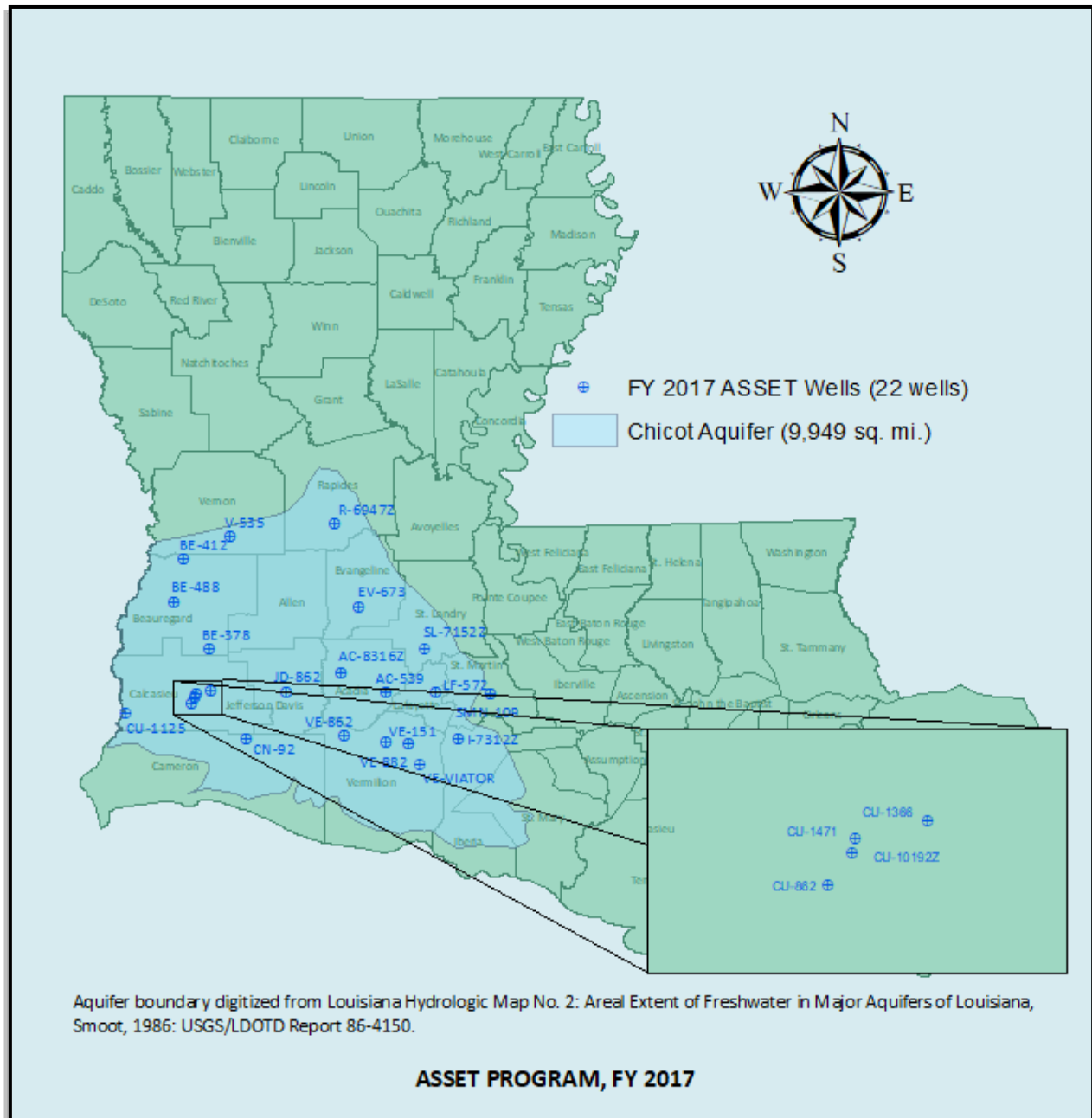


Chart 10-1: Temperature Trend

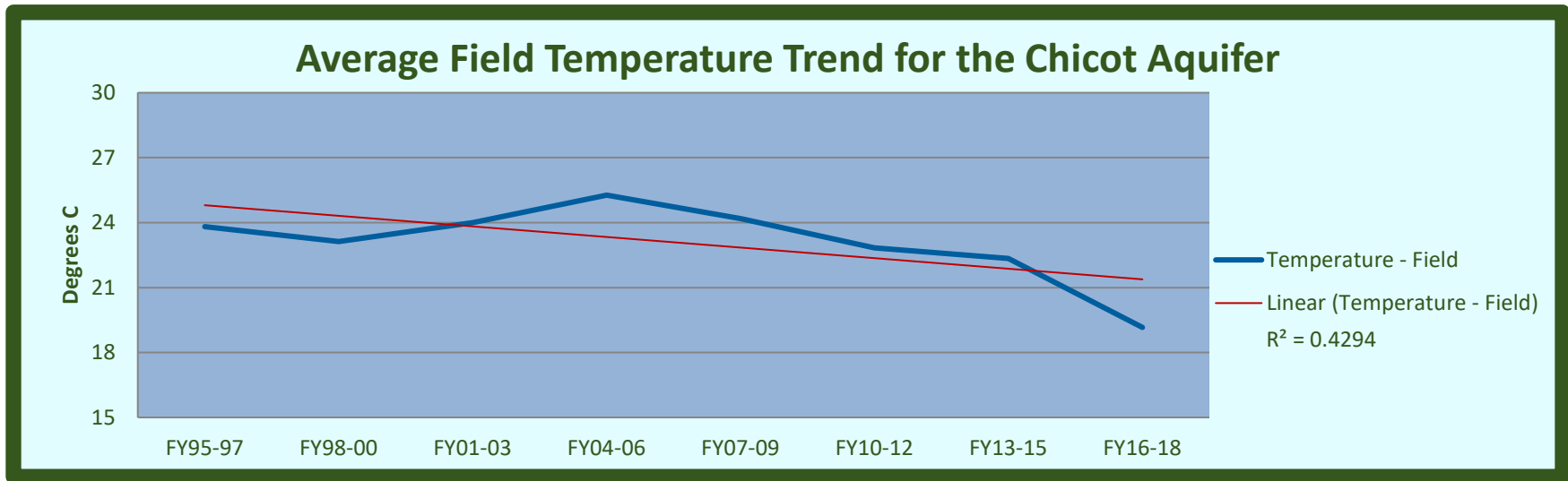


Chart 10-2: pH Trend

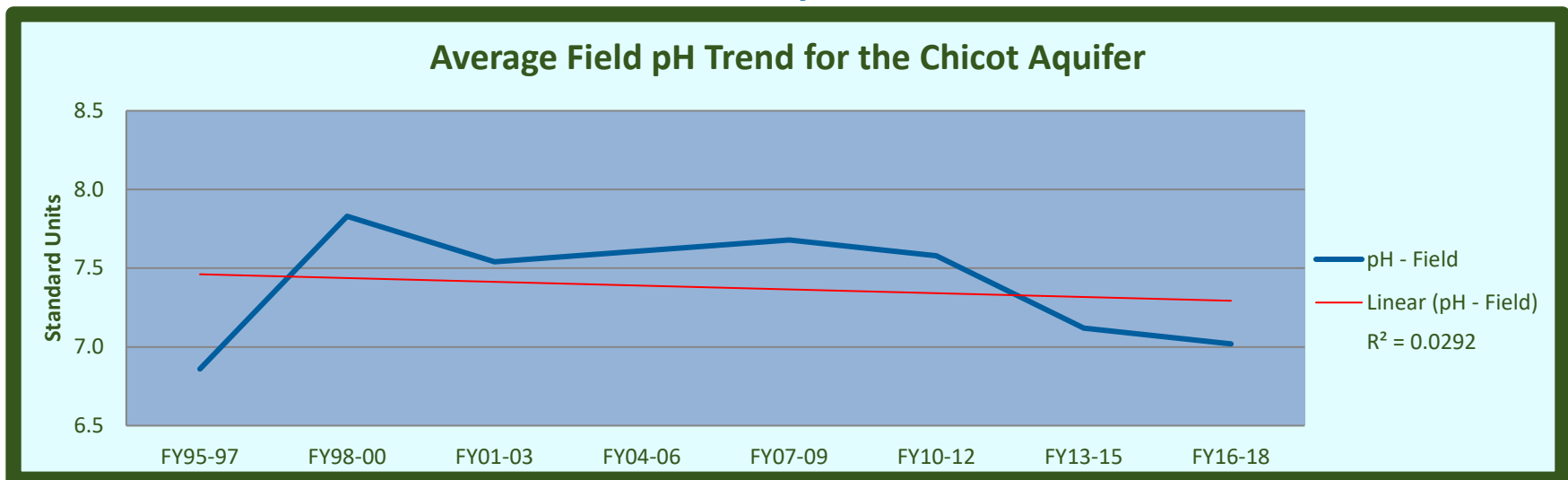


Chart 10-3: Specific Conductance Trend

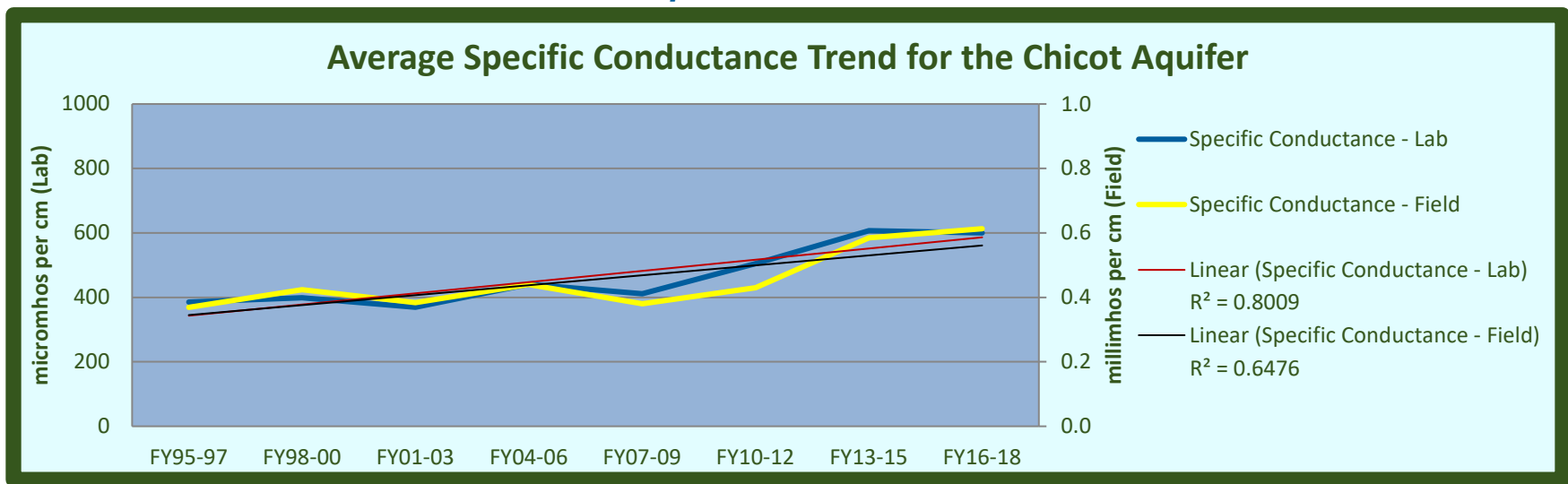


Chart 10-4: Field Salinity Trend

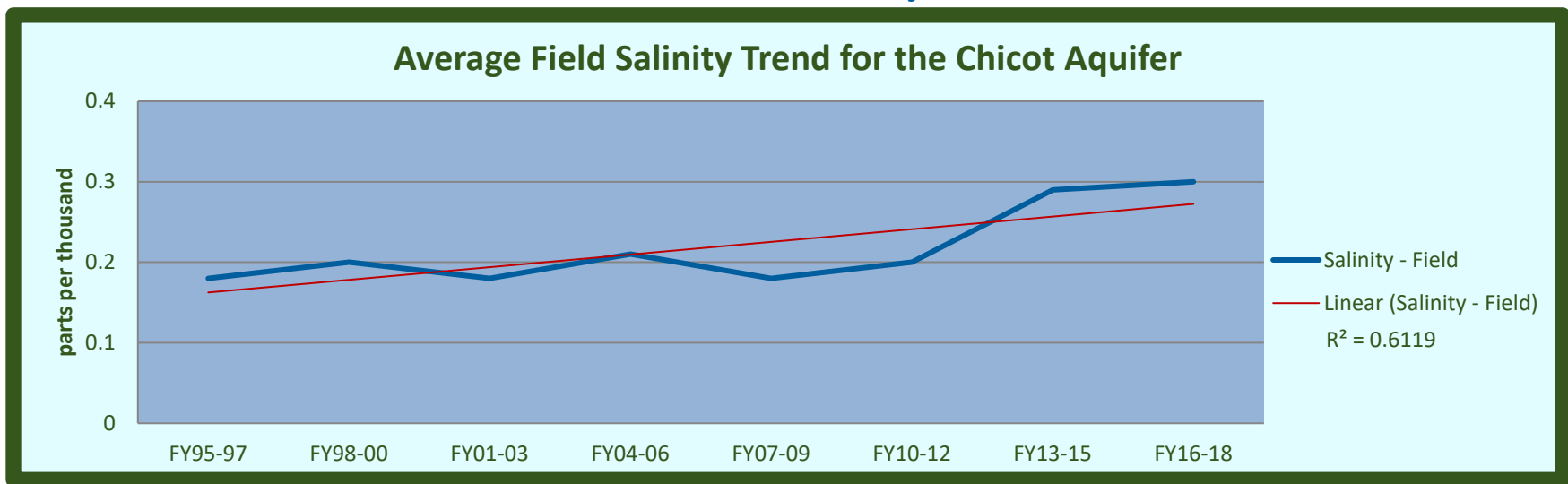


Chart 10-5: Chloride Trend

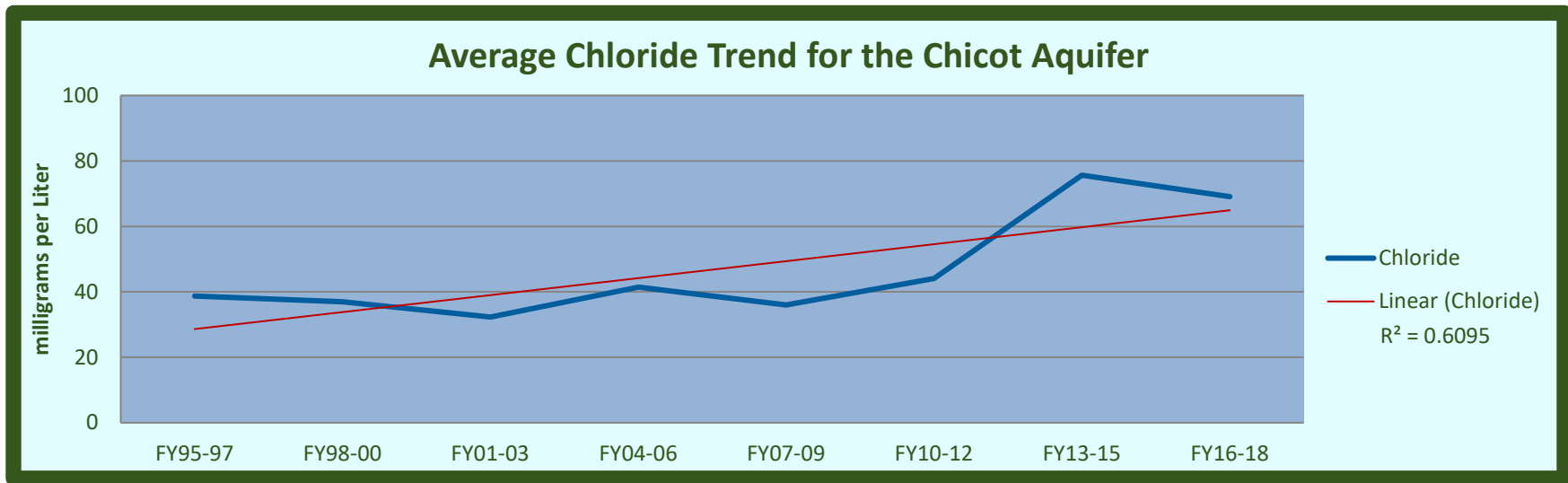


Chart 10-6: Total Dissolved Solids Trend

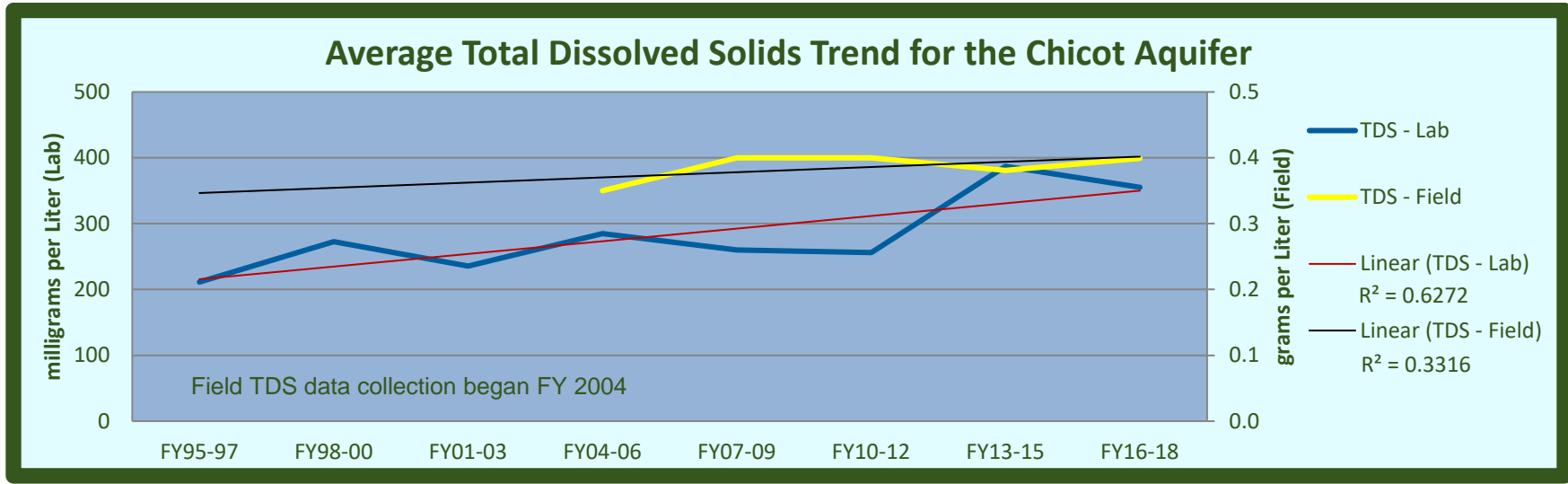


Chart 10-: Alkalinity Trend

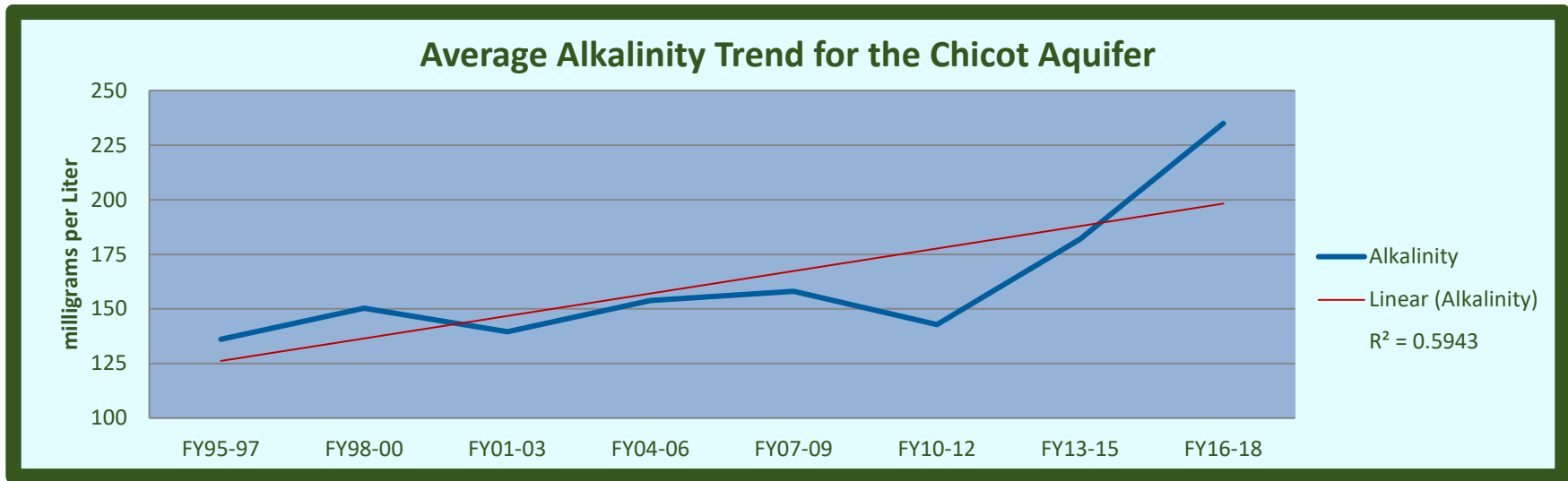


Chart 10-8: Hardness Trend

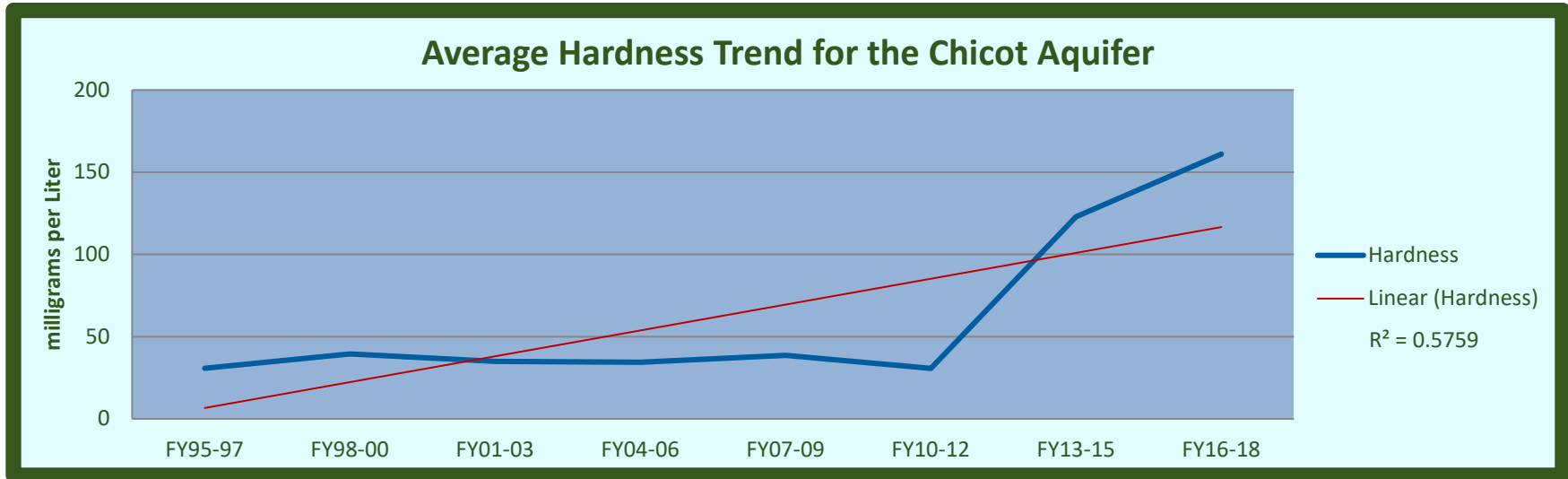


Chart 10-9: Sulfate Trend

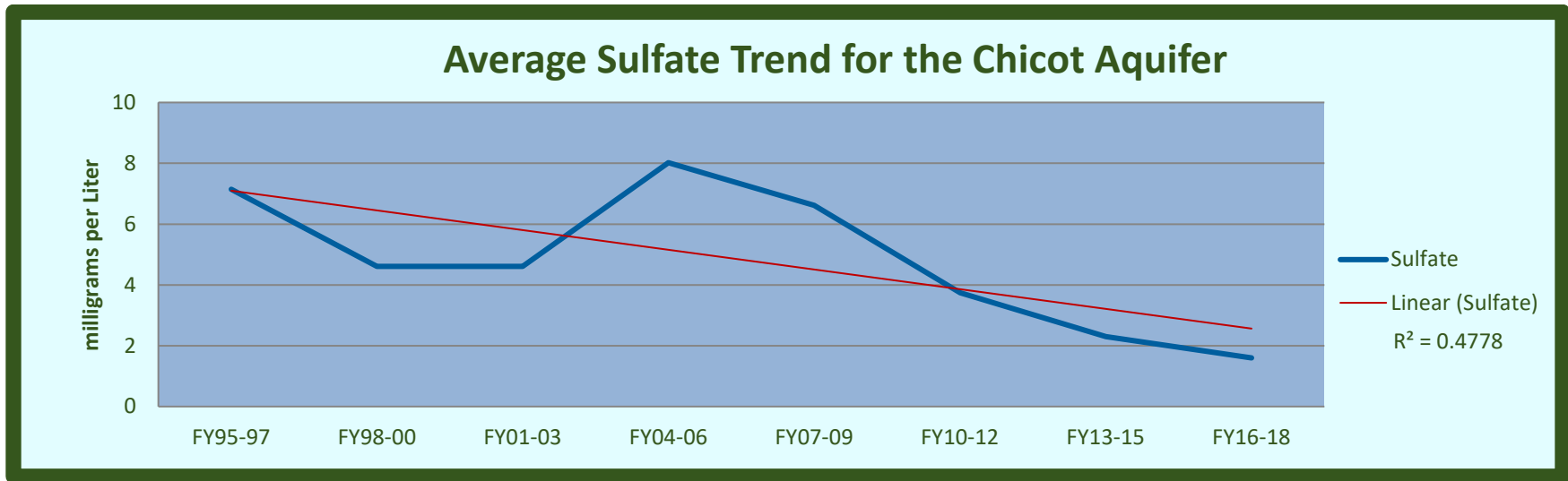


Chart 10-10: Color Trend

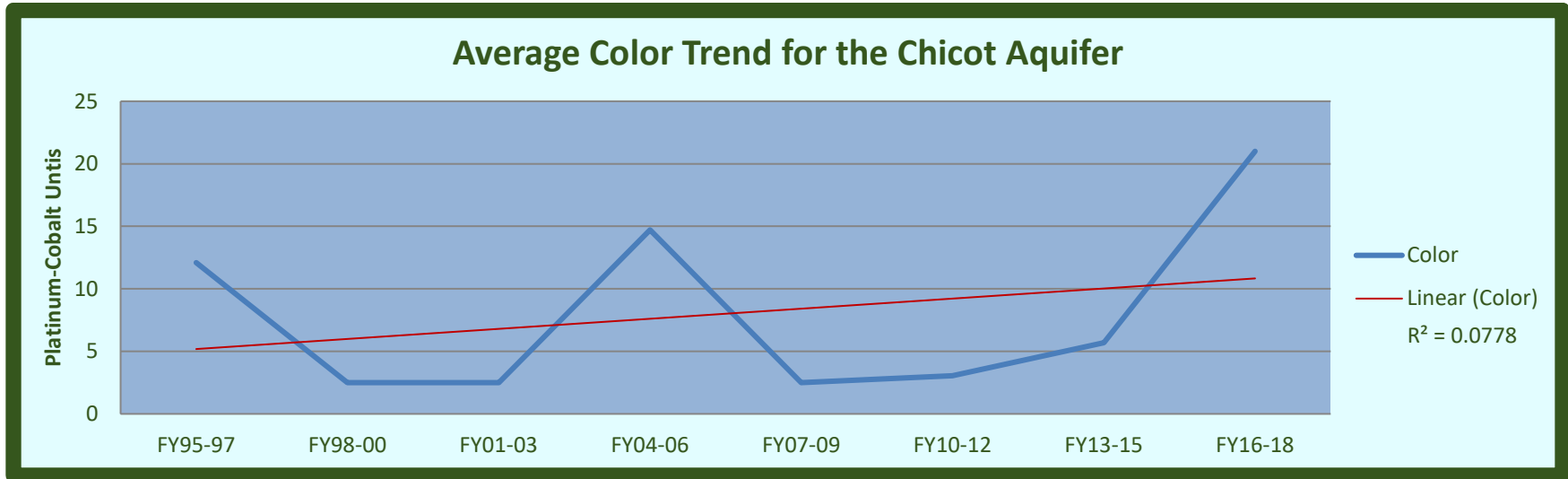


Chart 10-11: Ammonia Trend

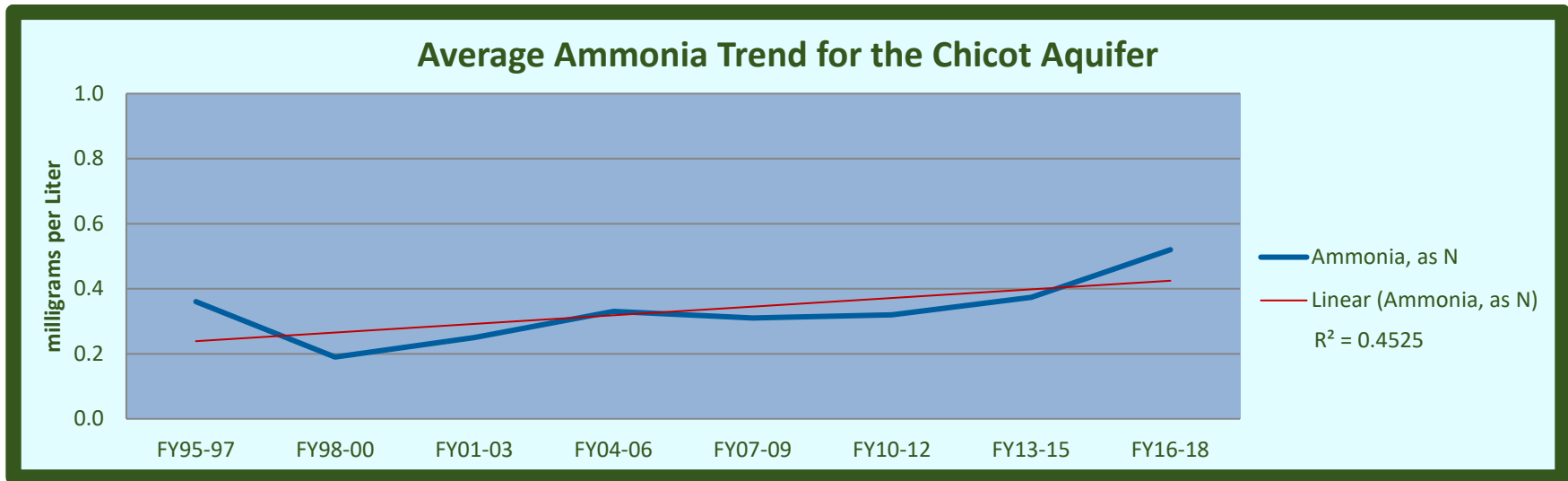


Chart 10-12: Nitrite – Nitrate Trend

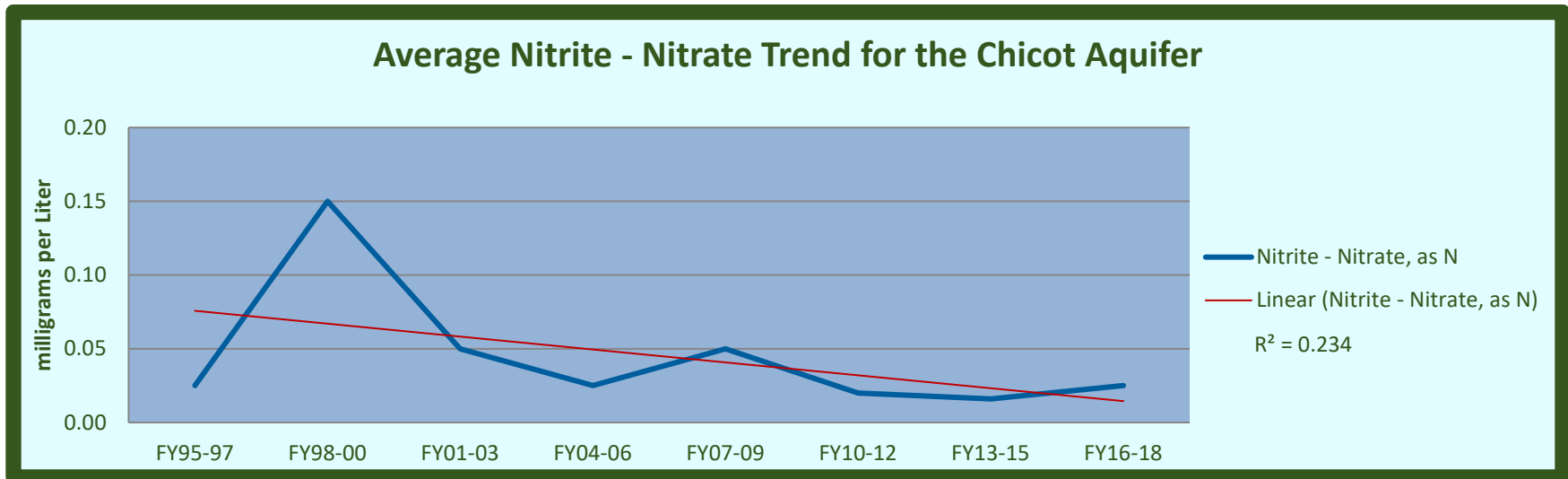


Chart 10-13: Total Kjeldahl Nitrogen Trend

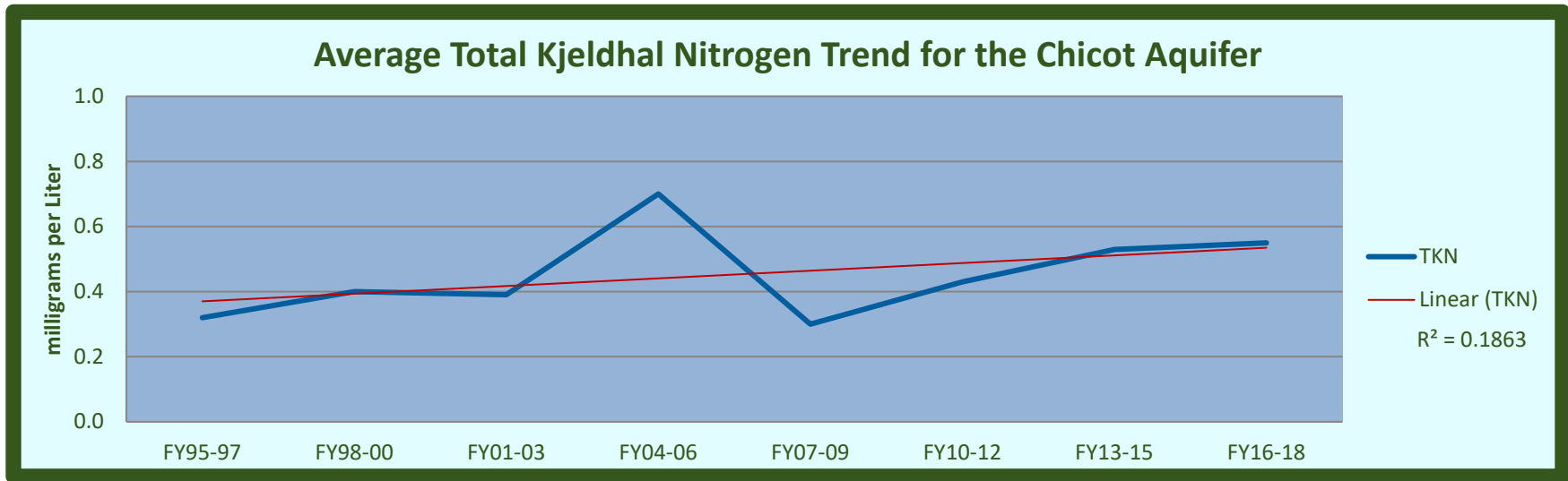


Chart 10-14: Total Phosphorus Trend

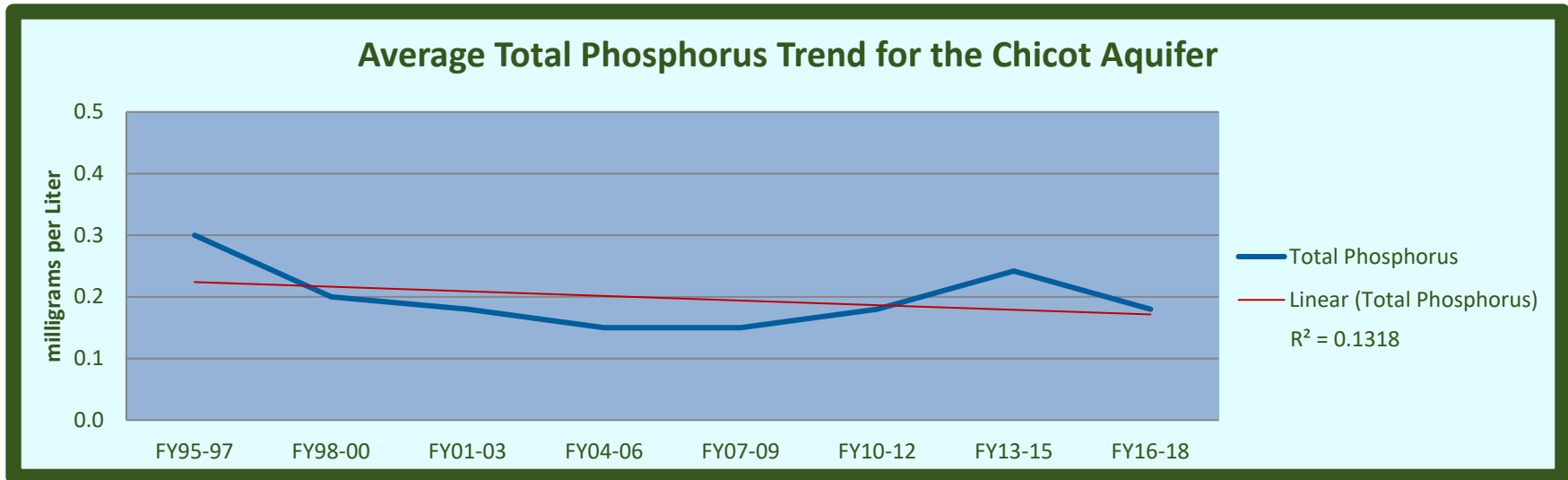


Chart 10-15: Barium Trend

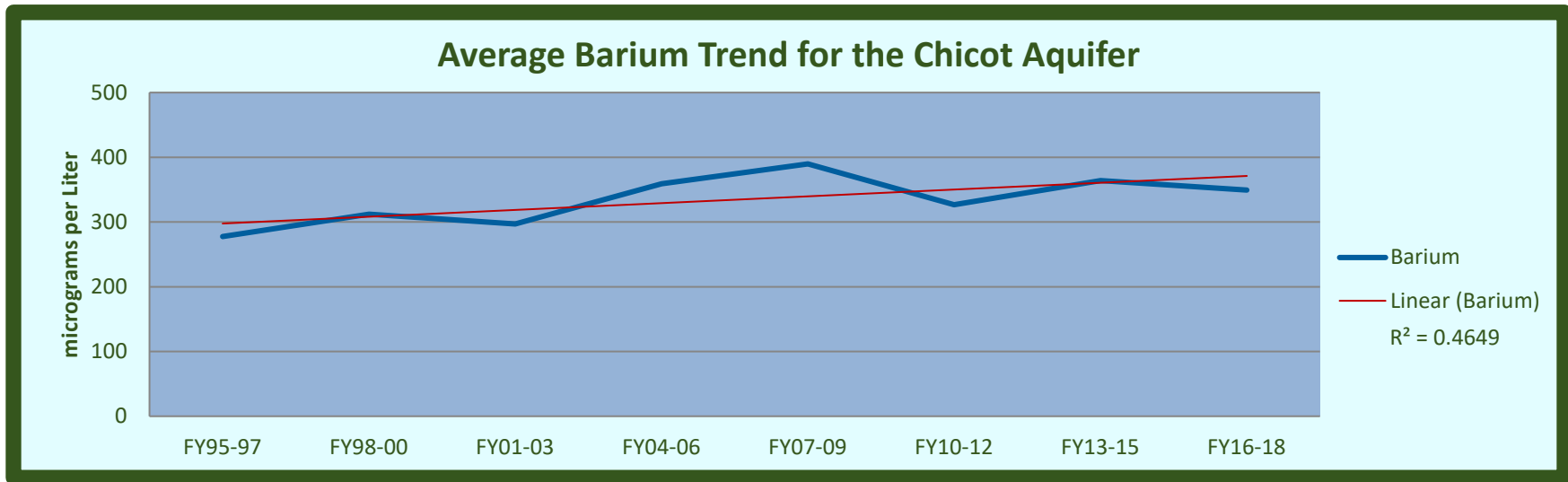


Chart 10-16: Copper Trend

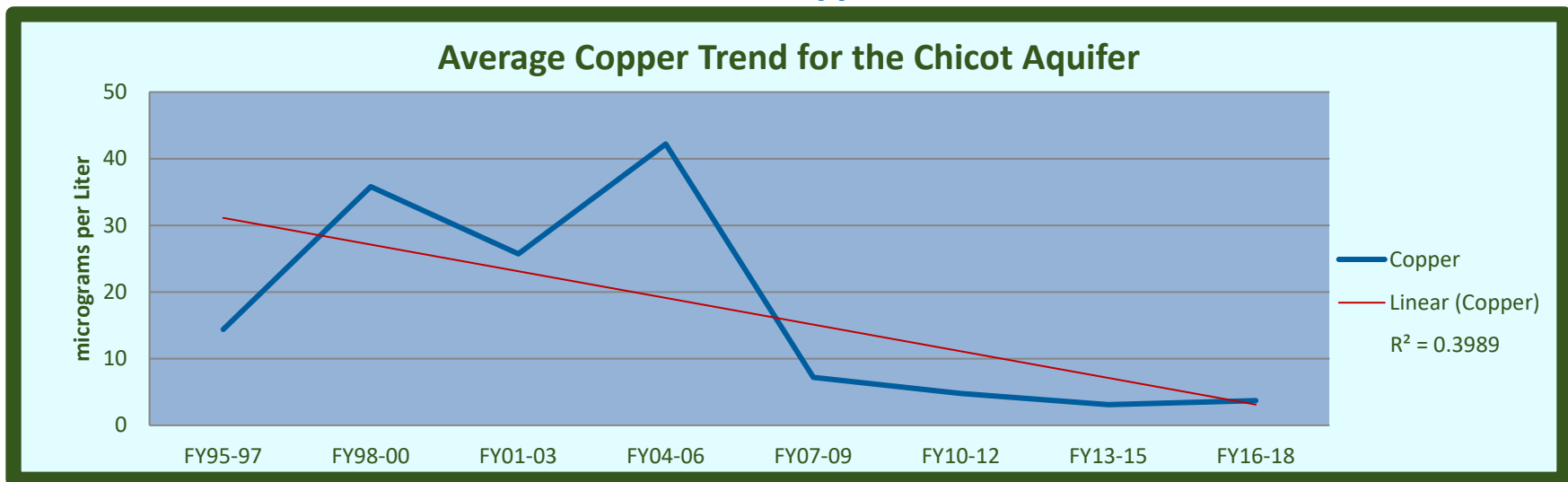


Chart 10-17: Iron Trend

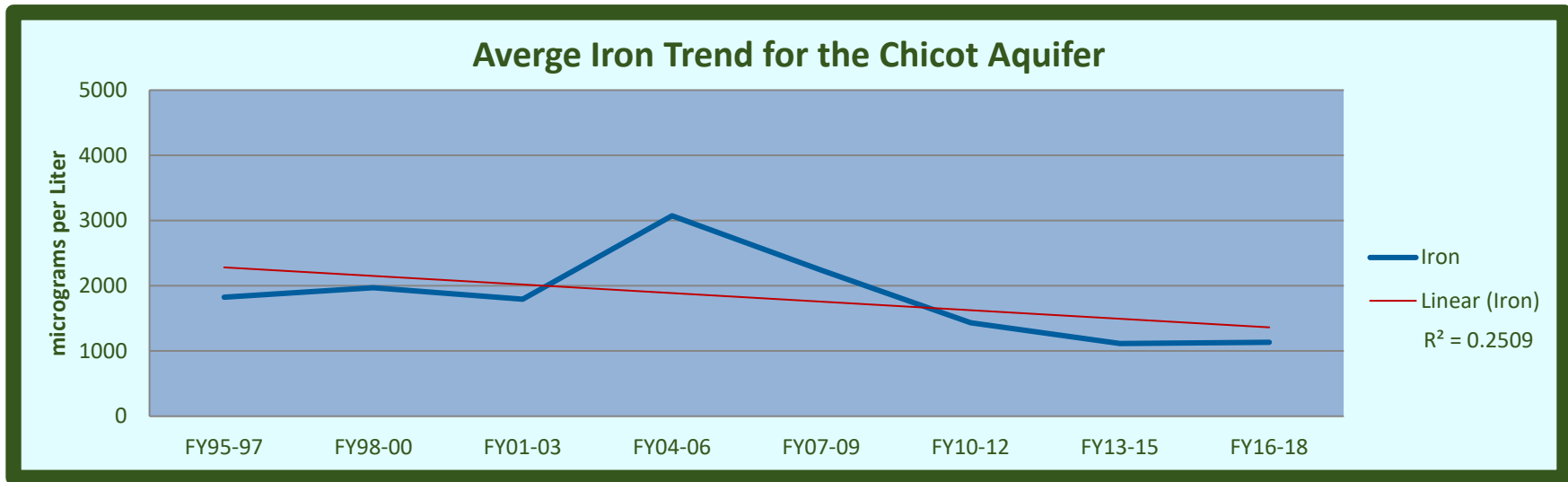


Chart 10-18: Zinc Trend

