# CHICOT AQUIFER SUMMARY, 2020

## AQUIFER SAMPLING AND ASSESSMENT PROGRAM

**APPENDIX 10 TO THE 2021 TRIENNIAL SUMMARY REPORT**

**PARTIAL FUNDING PROVIDED BY THE CWA**

# Contents

# 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 2020 state fiscal year (July 1, 2019 - June 30, 2020). This summary will become Appendix 10 of the ASSET Program Triennial Summary Report for 2021.

These data show that from February through May 2020, 16 wells were sampled which produce from the Chicot aquifer. Of these 16 wells, nine are classified as public supply, two industrial, four domestic, and one irrigation. The wells are located in 10 parishes in southwest Louisiana. Due to the 2020 Hurricane season and the coronavirus pandemic, wells in Cameron and Calcasieu parish were not sampled.

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 inter-stream, 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 well sampling site and the list of conventional parameters analyzed in the laboratory are shown in Table 10-2. The inorganic (total metals) 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 obtained for each parameter at wells BE-488, LF-572 and VE-882.

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, conventional, and inorganic data for the Chicot aquifer, listing the minimum, maximum, and average results for these parameters collected in the FY 2020 sampling. Tables 10-6 and 10-7 compare these same parameter averages to historical ASSET-derived data for the Chicot aquifer, from previous fiscal years.

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). The method used to generate the descriptive statistics varies, depending on the dataset and the proportion of values that are <DL. When estimating a dataset with more than 50 observations, the Maximum Likelihood estimation method is used. This is used to describe Upper and Lower confidence intervals or historical descriptive statistics. For datasets of less than 50 observations, the Kapan-Meier method is used. This is used to calculate descriptive statistics of a single

sampling round. If all values for a particular analyte are reported as < DL, then the minimum, maximum, and average values are all reported as < DL.

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 all of the 16 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 four wells exceeded the secondary standard for PH, and five wells exceeded the standard 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 | 6.02 SU |
| BE-488 | 5.99 SU Duplicate 6.01 SU |
| R-6974Z | 6.39 SU |
| V-535 | 5.24 SU |

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

| | LAB RESULTS (in mg/L) | FIELD MEASURES (in g/L) |
|---|---|---|
| AC-8316Z | 540 mg/L | 0.405 g/L |
| EV-673 | 501 mg/L | 0.425 g/L |
| VE-151 | 505 mg/L | 0.644 g/L |
| VE-862 | 605 mg/L | 0.730 g/L |
| VE-882 | 730 mg/L Duplicate 551 mg/L | 0.465 g/L Duplicate 0.430 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 for inorganics.

Federal Secondary Drinking Water Standards: Laboratory data contained in Table 10-3 shows that 12 of the 16 wells sampled exceeded the secondary MCL (SMCL) for iron as shown in the following list:

**Iron (SMCL = 300 µg/L):**

| | |
|---|---|
| AC-539 | 1980 µg/L |
| AC-8316Z | 2150 µg/L |
| BE-378 | 2370 µg/L |
| EV-673 | 1690 µg/L |
| I-7312Z | 972 µg/L |
| JD-862 | 2270 µg/L |
| LF-572 | 699 µg/L Duplicate 712 µg/L |
| SL-7152Z | 759 µg/L |
| VE-151 | 3400 µg/L |
| VE-862 | 968 µg/L |
| VE-882 | 1390 µg/L Duplicate 1420 µg/L |
| VE-VIATOR | 2780 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.

There were no confirmed detections of VOCs at or above their respective detection limits during the FY 2020 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.

There were no confirmed detections of SVOCs at or above their respective detection limits during the FY 2020 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 2020 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 eight previous sampling rotations. These comparisons are in Tables 10-6 and 10-7, and in Charts 10-1 to 10-18 of this summary. Trend analysis charts were computed to analyze for upwards or downwards trends. Using linear regression, the charts indicate a trend-line and normality of residuals. Strong indications of a trend occur when the p value is less than 0.5.

Over the 24-year period, two analytes have shown general increases in average concentrations, while three have shown general decreases. Analytes exhibiting increases are: total Kjeldahl nitrogen and total phosphorous. Analytes exhibiting decreases are: temperature, total dissolved solids, and sulfate. 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 decreased from the previous sampling in FY 2017 from 37 SMCL exceedances to 21 in FY 2020. However, this number does not reflect the ASSET wells in the area of Lake Charles, LA. This area was not sampled in the FY 2020 sampling due hurricane Laura.

## SUMMARY AND RECOMMENDATIONS

In summary, the data show that the ground water produced from this aquifer is hard[1] 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 2020 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 (16) with SMCL exceedances.

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

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

It is recommended that the wells assigned to the Chicot aquifer be re-sampled as planned, in approximately three years. In addition, several wells should be added to the 22 currently in place to increase the well density for this aquifer.

## *Table 10-1: List of Wells Sampled, Chicot Aquifer – FY 2021*

| Well ID | Parish | Date | Owner | Depth (Feet) | Well Use |
|---|---|---|---|---|---|
| AC-539 | Acadia | 02/19/2020 | City Of Rayne | 251 | Public Supply |
| AC-8316Z | Acadia | 02/19/2020 | Private Owner | 165 | Domestic |
| BE-378 | Beauregard | 05/13/2020 | Transcontinental Gas Pipeline | 172 | Industrial |
| BE-412 | Beauregard | 05/13/2020 | Boise - Deridder | 202 | Industrial |
| BE-488 | Beauregard | 05/14/2020 | Singer Water District | 262 | Public Supply |
| EV-673 | Evangeline | 02/19/2020 | City Of Mamou | 247 | Public Supply |
| I-7312Z | Iberia | 03/05/2020 | Breaux Electric | 180 | Public Supply |
| JD-862 | Jefferson Davis | 05/13/2020 | City Of Welsh | 697 | Public Supply |
| LF-572 | Lafayette | 02/19/2020 | LUS | 570 | Public Supply |
| R-6947Z | Rapides | 05/14/2020 | Private Owner | 110 | Domestic |
| SL-7152Z | St. Landry | 02/19/2020 | Private Owner | 180 | Domestic |
| V-535 | Vernon | 05/14/2020 | Marlow Fire Station | 66 | Public Supply |
| VE-151 | Vermilion | 03/05/2020 | Vermilion Oaks Country Club | 250 | Irrigation |
| VE-862 | Vermilion | 03/05/2020 | Town of Gueydan | 249 | Public Supply |
| VE-882 | Vermilion | 03/05/2020 | City of Kaplan | 279 | Public Supply |
| VE-VIATOR | Vermilion | 03/05/2020 | Private Owner | 200 | Domestic |

## *Table 10-2: Summary of Field and Conventional Data, Chicot Aquifer – FY 2020*

| Well ID | pH SU | Sal ppt | Sp Cond mmhos/cm | TDS mg/L | Temp Deg C | 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 | 7.54 | 0.33 | 0.66 | 370.00 | 17.44 | 274.00 | 25.80 | < DL | 204.00 | < DL | 1.60 | 0.38 | 0.64 | < DL | 435.00 | 4.00 | 10.30 | 7.54 |
| AC-8316Z | 7.57 | 0.41 | 0.78 | 405.00 | 16.03 | 269.00 | 70.00 | < DL | 246.00 | < DL | 2.00 | 0.32 | 0.83 | 7.90 | 540.00 | < DL | 19.00 | 7.57 |
| BE-378 | 7.06 | 0.02 | 0.45 | 10.00 | 22.47 | 93.10 | 44.20 | 10.00 | 74.00 | 0.05 | 0.26 | 0.41 | < DL | 4.60 | 10.00 | < DL | 4.30 | 7.06 |
| BE-412 | 6.02 | 0.03 | 0.56 | 47.74 | 21.31 | 11.90 | 5.90 | < DL | 38.00 | 0.09 | < DL | < DL | 0.76 | 2.50 | 10.00 | < DL | 0.95 | 6.02 |
| BE-488 | 5.99 | 0.33 | 0.07 | 47.74 | 21.30 | 21.80 | 6.10 | 10.00 | 28.00 | 0.05 | 0.36 | < DL | 0.10 | 1.00 | 125.00 | < DL | 1.60 | 5.99 |
| BE-488* | 6.01 | 0.03 | 0.07 | 47.75 | 21.32 | 23..80 | 6.10 | 5.00 | 50.00 | 0.05 | 0.09 | 0.05 | 1.02 | 9.30 | 30.00 | 4.00 | 0.75 | 6.01 |
| EV-673 | 7.36 | 0.38 | 0.75 | 425.00 | 16.89 | 231.00 | 77.70 | < DL | 198.00 | < DL | 0.29 | 0.43 | 0.77 | 1.50 | 501.00 | < DL | 10.10 | 7.36 |
| I-7312Z | 7.44 | 0.22 | 0.45 | 230.00 | 18.21 | 206.00 | 4.50 | 10.00 | 190.00 | < DL | 0.64 | < DL | 0.46 | 1.00 | 301.00 | < DL | 7.00 | 7.44 |
| JD-862 | 6.53 | 0.47 | 0.95 | 808.70 | 24.49 | 118.00 | 196.00 | 10.00 | 164.00 | < DL | 0.53 | 0.36 | 1.23 | 1.00 | 435.00 | 7.00 | 16.20 | 6.53 |
| LF-572 | 7.48 | 0.21 | 0.40 | 185.00 | 16.14 | 175.00 | 7.00 | < DL | 186.00 | < DL | 0.51 | 0.32 | 0.43 | 4.90 | 277.00 | < DL | 5.20 | 7.48 |
| LF-572* | 7.48 | 0.21 | 0.42 | 277.00 | 16.14 | 170.00 | 7.50 | <DL | 182.00 | 0.05 | 0.53 | 0.42 | 0.39 | 4.70 | 240.00 | 4.00 | 4.60 | 5.20 |
| R-6947Z | 6.39 | 0.02 | 0.05 | 348.90 | 20.70 | 12.90 | 3.80 | < DL | 34.00 | 0.56 | 0.17 | < DL | 0.07 | 1.10 | < DL | < DL | 1.10 | 6.39 |
| SL-7152Z | 7.42 | 0.20 | 0.39 | 235.00 | 15.68 | 179.00 | 4.60 | < DL | 172.00 | < DL | 1.50 | 0.49 | 0.41 | < DL | 265.00 | < DL | 5.70 | 7.42 |
| V-535 | 5.24 | 0.01 | 0.03 | 166.00 | 20.28 | < DL | 2.70 | 10.00 | 50.00 | < DL | 0.27 | < DL | < DL | < DL | 35.00 | 9.00 | 17.90 | 5.24 |
| VE-151 | 7.41 | 0.49 | 0.93 | 505.00 | 17.82 | 314.00 | 113.00 | 10.00 | 720.00 | < DL | 0.91 | < DL | 0.99 | < DL | 644.00 | 8.00 | 32.90 | 7.41 |
| VE-862 | 7.40 | 0.56 | 1.16 | 605.00 | 18.14 | 329.00 | 125.00 | 10.00 | 252.00 | < DL | 2.30 | 1.00 | 1.12 | < DL | 730.00 | < DL | 3.10 | 7.40 |
| VE-882 | 7.61 | 0.42 | 0.86 | 465.00 | 17.17 | 295.00 | 56.80 | 10.00 | 236.00 | < DL | 1.20 | < DL | 0.85 | < DL | 730.00 | < DL | 3.10 | 7.61 |
| VE-882* | 7.61 | 0.42 | 0.83 | 430.00 | 17.14 | 319.00 | 56.60 | 10.00 | 240.00 | 0.05 | 1.60 | 0.28 | 0.85 | 1.00 | 551.00 | 5.00 | 6.60 | 3.10 |
| VE-VIATOR | 7.47 | 0.24 | 0.49 | 185.00 | 16.38 | 206.00 | 9.70 | 10.00 | 214.00 | < DL | 1.60 | < DL | 0.50 | < DL | 323.00 | 10.00 | 25.50 | 7.47 |

*Duplicate Sample

Shaded cells exceed EPA Secondary Standards

## *Table 10-3: Summary of Inorganic Data, Chicot Aquifer – FY 2020*

| 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 | 539.00 | < DL | < DL | < DL | < DL | 1980 | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| AC-8316Z | < DL | < DL | 499.00 | < DL | < DL | < DL | < DL | 2150 | < DL | < DL | < DL | < DL | < DL | < DL | 8.60 |
| BE-378 | < DL | 1.4 | 132.00 | < DL | < DL | < DL | < DL | 2370 | < DL | < DL | < DL | < DL | < DL | < DL | 10.00 |
| BE-412 | < DL | < DL | 99.60 | < DL | < DL | 1.30 | < DL | < DL | < DL | < DL | 1.30 | < DL | < DL | < DL | 17.40 |
| BE-488 | < DL | < DL | 75.10 | < DL | < DL | 1.10 | < DL | 50.9 | < DL | < DL | 1.70 | < DL | < DL | < DL | 6.10 |
| BE-488* | <DL | <DL | 76.40 | <DL | <DL | <DL | 2.10 | <DL | <DL | <DL | 1.60 | <DL | <DL | <DL | <DL |
| EV-673 | < DL | 2.80 | 255.00 | < DL | < DL | < DL | 4.40 | 1690 | < DL | < DL | < DL | < DL | < DL | < DL | 15.00 |
| I-7312Z | < DL | 1.40 | 168.00 | < DL | < DL | < DL | < DL | 972 | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| JD-862 | < DL | < DL | 770.00 | < DL | < DL | < DL | < DL | 2270 | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| LF-572 | < DL | < DL | 204.00 | < DL | < DL | < DL | < DL | 699 | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| LF-572* | <DL | <DL | 200.00 | <DL | <DL | <DL | <DL | 712 | <DL | <DL | <DL | <DL | <DL | <DL | <DL |
| R-6947Z | < DL | < DL | 38.80 | < DL | < DL | < DL | < DL | < DL | < DL | < DL | 1.30 | < DL | < DL | < DL | 11.00 |
| SL-7152Z | < DL | < DL | 132.00 | < DL | < DL | < DL | < DL | 759 | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| V-535 | < DL | < DL | 28.90 | < DL | < DL | < DL | 390.00 | 155 | 1.10 | < DL | < DL | < DL | < DL | < DL | 99.40 |
| VE-151 | < DL | 1.80 | 347.00 | < DL | < DL | < DL | < DL | 3400 | < DL | < DL | < DL | < DL | < DL | < DL | 5.10 |
| VE-862 | < DL | < DL | 942.00 | < DL | < DL | < DL | < DL | 968 | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| VE-882 | < DL | < DL | 607.00 | < DL | < DL | < DL | < DL | 1390 | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| VE-882* | <DL | <DL | 622.00 | <DL | <DL | <DL | <DL | 1420 | <DL | <DL | <DL | <DL | <DL | <DL | <DL |
| VE-VIATOR | < DL | 7.70 | 138.00 | < DL | < DL | < DL | < DL | 2780 | < DL | < DL | < DL | < DL | < DL | < DL | < DL |

*Duplicate Sample

Exceed EPA Secondary Standards

## *Table 10-4: Field and Conventional Statistics, FY 2020 ASSET Wells*

| | PARAMETER | MINIMUM | MAXIMUM | AVERAGE |
|---|---|---|---|---|
| FIELD | pH (SU) | 5.24 | 7.61 | 7.02 |
| | Salinity (ppt) | 0.01 | 0.56 | 0.26 |
| | Specific Conductance (umhos/cm) | 25.57 | 1124.00 | 345.10 |
| | Temperature ($^{O}$C) | 15.68 | 24.50 | 20.67 |
| | Total Dissolved Solids (g/L) | 16.61 | 730.00 | 224.29 |
| LABORATORY | Alkalinity (mg/L) | 5.00 | 329.00 | 171.27 |
| | Chloride (mg/L) | 2.70 | 1300.00 | 104.16 |
| | Color (PCU) | 5.00 | 10.00 | 9.00 |
| | Hardness (mg/L) | 28.00 | 720.00 | 183.05 |
| | Nitrite - Nitrate, as N (mg/L) | < DL | 1.3 | 0.10 |
| | Ammonia, as N (mg/L) | < DL | 2.00 | 0.66 |
| | Total Phosphorus (mg/L) | < DL | 0.50 | 0.35 |
| | Specific Conductance (µmhos/cm) | 31.00 | 1230.00 | 551.66 |
| | Sulfate (mg/L) | < DL | 9.32 | 2.75 |
| | Total Dissolved Solids (mg/L) | <DL | 605.00 | 301.07 |
| | Total Kjeldahl Nitrogen (mg/L) | 0.10 | 2.30 | 0.87 |
| | Total Suspended Solids (mg/L) | < DL | 10 | 3.78 |
| | Turbidity (NTU) | 0.75 | 32.90 | 9.75 |

## *Table 10-5: Inorganic Statistics, FY 2020 ASSET Wells*

| PARAMETER | MINIMUM | MAXIMUM | AVERAGE |
|---|---|---|---|
| Antimony (µg/L) | < DL | < DL | < DL |
| Arsenic (µg/L) | < DL | 7.70 | 1.25 |
| Barium (µg/L) | 38.80 | 607.00 | 310.96 |
| Beryllium (µg/L) | < DL | < DL | < DL |
| Cadmium (µg/L) | < DL | < DL | < DL |
| Chromium (µg/L) | < DL | 1.00 | < DL |
| Copper (µg/L) | < DL | 390.00 | 7.87 |
| Iron (µg/L) | < DL | 3400.00 | 2518.00 |
| Lead (µg/L) | 0.11 | 2.80 | < DL |
| Mercury (µg/L) | < DL | < DL | < DL |
| Nickel (µg/L) | < DL | 1.7 | 0.87 |
| Selenium (µg/L) | < DL | < DL | < DL |
| Silver (µg/L) | < DL | < DL | < DL |
| Thallium (µg/L) | < DL | < DL | < DL |
| Zinc (µg/L) | < DL | 88.70 | 8.59 |

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

| | PARAMETER | FY 1996 | FY 1999 | FY 2002 | FY 2005 | FY 2008 | FY 2011 | FY 2014 | FY 2017 | FY 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AVERAGE VALUES BY FISCAL YEAR | | | | | | | |
| FIELD | pH (SU) | 7.08 | 7.01 | 7.03 | 7.22 | 7.33 | 7.28 | 7.02 | 7.02 | 7.02 |
| FIELD | Salinity (ppt) | 0.26 | 0.33 | 0.25 | 0.27 | 0.31 | 0.30 | 0.30 | 0.30 | 0.26 |
| FIELD | Specific Conductance (mmhos/cm) | 0.534 | 0.650 | 0.5230 | 0.540 | 0.630 | 0.610 | 0.613 | 0.613 | 0.345 |
| FIELD | Temperature (OC) | 22.68 | 23.20 | 21.85 | 22.38 | 22.47 | 20.91 | 19.16 | 19.16 | 20.67 |
| FIELD | Total Dissolved Solids (g/L) | - | - | - | 0.350 | 0.400 | 0.400 | 0.399 | 0.399 | 0.224 |
| LABORATORY | Alkalinity (mg/L) | 200 | 189 | 193 | 190 | 216 | 210 | 235 | 235 | 171 |
| LABORATORY | Chloride (mg/L) | 67.5 | 59.6 | 51.6 | 59.7 | 85.9 | 67.7 | 69.1 | 69.1 | 104.16 |
| LABORATORY | Color (PCU) | 22 | 13 | 14 | 13 | 24 | 9 | 21 | 21 | 9.00 |
| LABORATORY | Hardness (mg/L) | 130 | 123 | 127 | 133 | 162 | 162 | 161 | 161 | 183 |
| LABORATORY | Nitrite - Nitrate, as N (mg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | 0.10 |
| LABORATORY | Ammonia, as N (mg/L) | 0.36 | 0.35 | 0.41 | 0.32 | 0.36 | 0.40 | 0.52 | 0.52 | 0.66 |
| LABORATORY | Total Phosphorus (mg/L) | 0.24 | 0.25 | 0.13 | 0.23 | 0.21 | 0.20 | 0.18 | 0.18 | 0.35 |
| LABORATORY | Specific Conductance (µmhos/cm) | 594 | 552 | 502 | 539 | 660 | 571 | 600 | 600 | 551 |
| LABORATORY | Sulfate (mg/L) | 2.1 | 2.8 | 1.5 | 2.0 | 2.8 | 3.3 | 1.6 | 1.6 | 2.75 |
| LABORATORY | Total Dissolved Solids (mg/L) | 369 | 352 | 302 | 322 | 384 | 370 | 355 | 355 | 301 |
| LABORATORY | Total Kjeldahl Nitrogen (mg/L) | 0.35 | 0.67 | 0.58 | 0.50 | 0.43 | 0.63 | 0.55 | 0.55 | 0.87 |
| LABORATORY | Total Suspended Solids (mg/L) | 20 | 5 | 4 | 18 | 4 | 7 | < DL | < DL | 3.78 |
| LABORATORY | Turbidity (NTU) | 13.8 | 14.6 | 13.8 | 16.2 | 20.8 | 12.3 | 8.5 | 8.5 | 9.75 |

## Table 10-7: Triennial Inorganic Statistics, ASSET Wells

| PARAMETER | FY 1996 | FY 1999 | FY 2002 | FY 2005 | FY 2008 | FY 2011 | FY 2014 | FY 2017 | FY 2020 |
|---|---|---|---|---|---|---|---|---|---|
| | | AVERAGE VALUES BY FISCAL YEAR | | | | | | | |
| Antimony (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| Arsenic (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | 1.0 | 1.25 |
| Barium (µg/L) | 277.6 | 312.0 | 297.0 | 359.0 | 389.8 | 326.9 | 364 | 349.2 | 310.96 |
| Beryllium (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| Cadmium (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| Chromium (µg/L) | < DL | < 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 | 7.87 |
| Iron (µg/L) | 1824 | 1971 | 1795 | 3074 | 2238 | 1432 | 1115 | 1134 | 2518 |
| Lead (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| Mercury (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| Nickel (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | 0.87 |
| Selenium (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| Silver (µg/L) | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL | < DL |
| Thallium (µg/L) | < DL | < 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 | 8.59 |

## *Table 10-8: Volatile Organic Compound List*

| VOC ANAYTICAL 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 ANAYTICAL 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 |

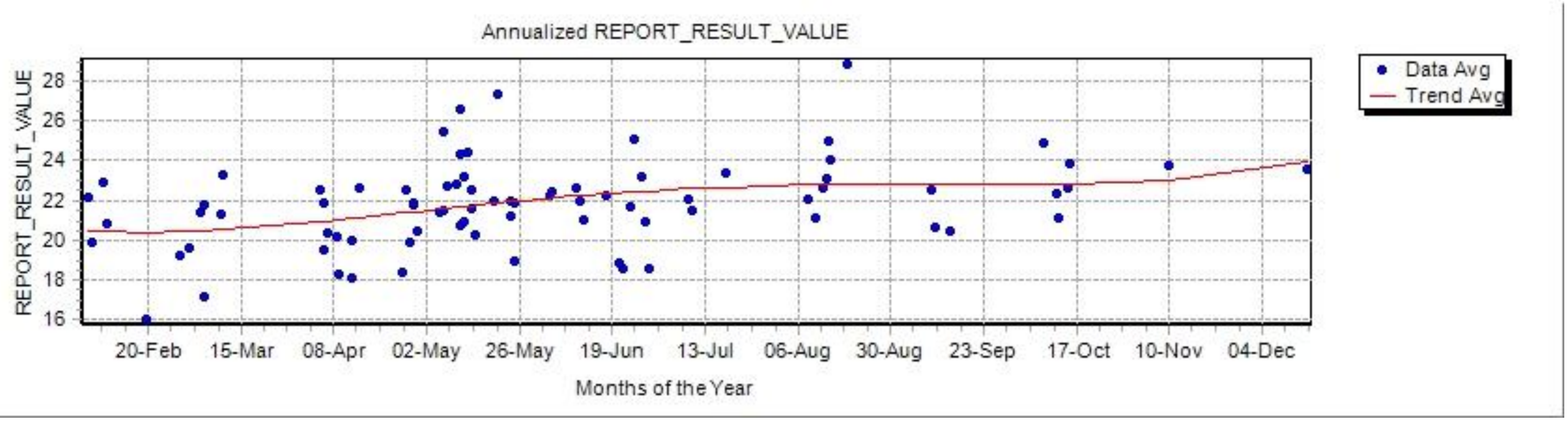
| SVOC ANAYTICAL PARAMETERS | METHOD | REPORTING LIMIT (µg/L) |
|---|---|---|
| HEXACHLOROBENZENE | 625 | 5.0 |
| HEXACHLOROBUTADIENE | 625 | 5.0 |
| HEXACHLOROCYCLOPENTADIENE | 625 | 10.0 |
| HEXACHLOROETHANE | 625 | 5.0 |
| INDENO(1,2,3-C,D)PYRENE | 625 | 0.20 |
| ISOPHORONE | 625 | 5.0 |
| NAPHTHALENE | 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 |

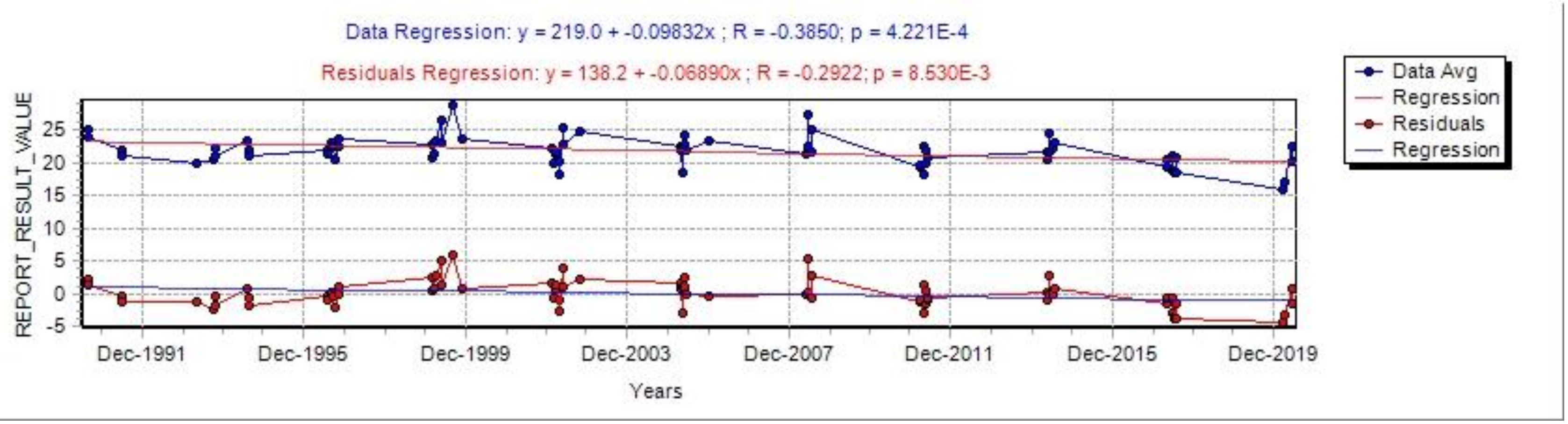
## *Table 10-10: Pesticide and PCB List*

| 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 |

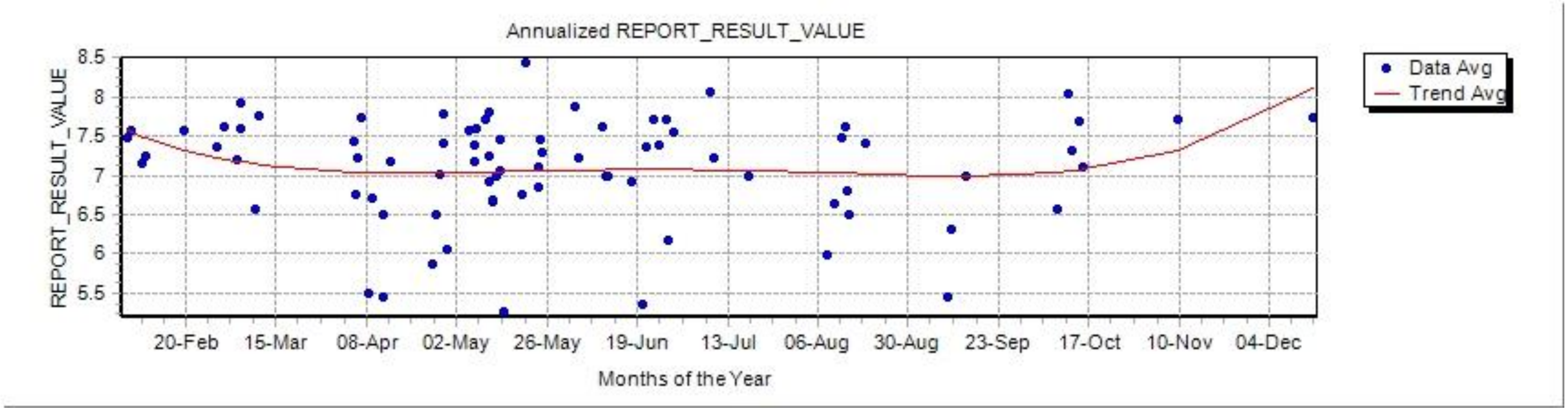
### *Figure 10-1: Location Plat, Chicot Aquifer*

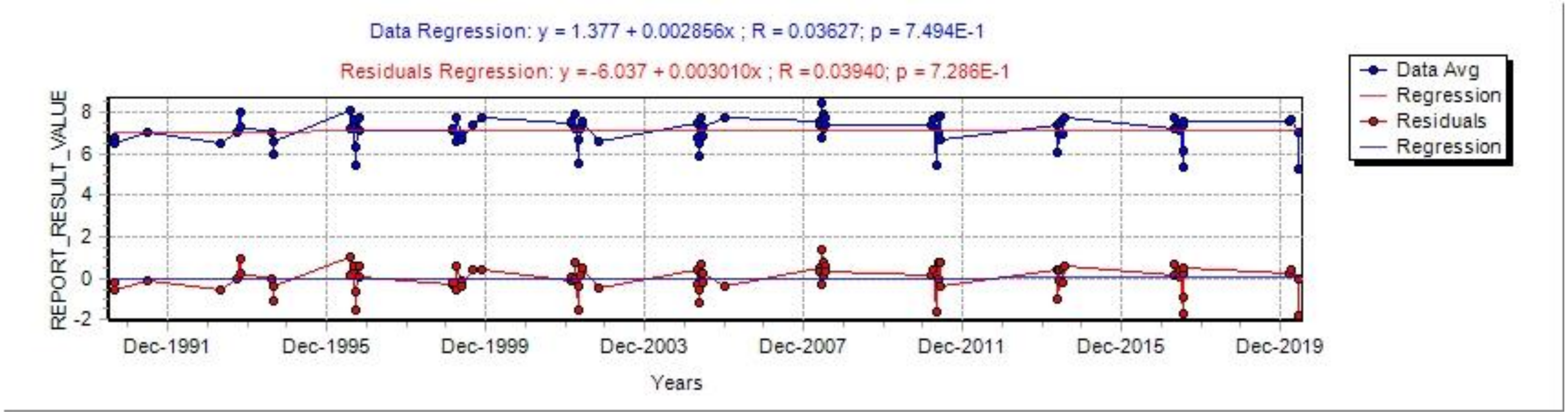
## *Chart 10-1: Temperature Trend*



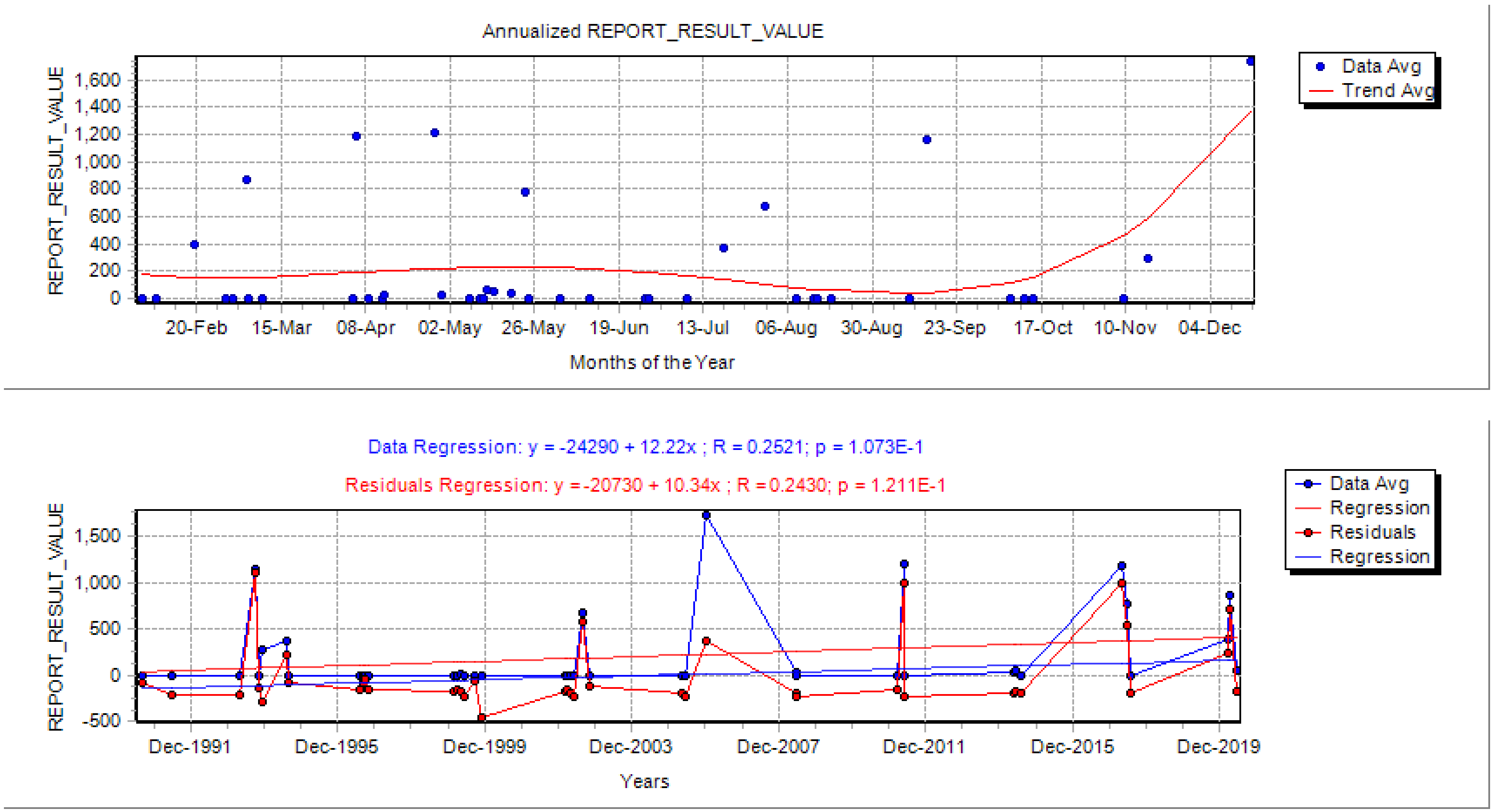



## *Chart 10-2: pH Trend*

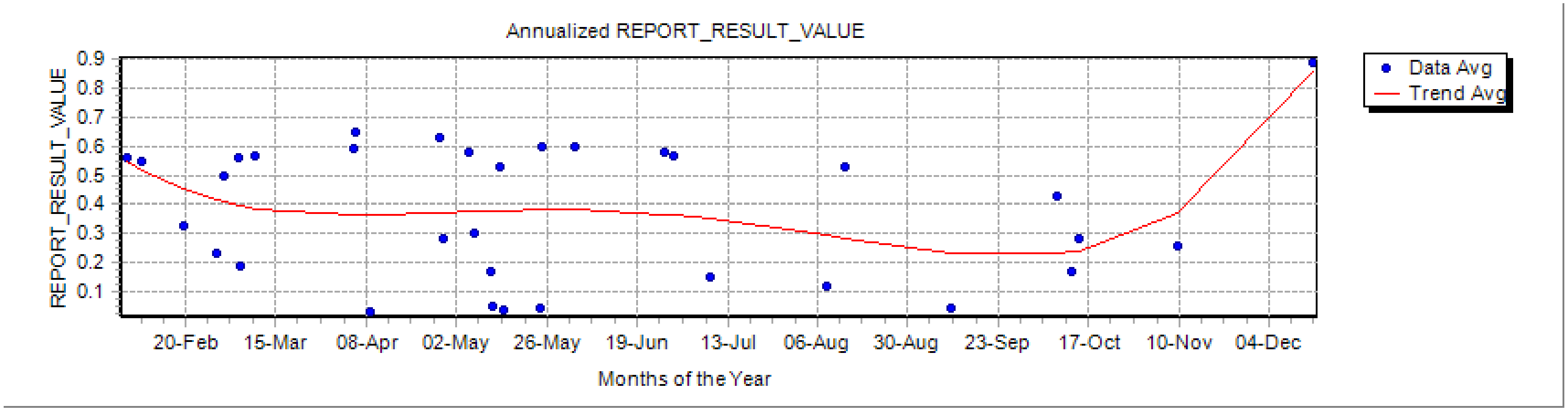


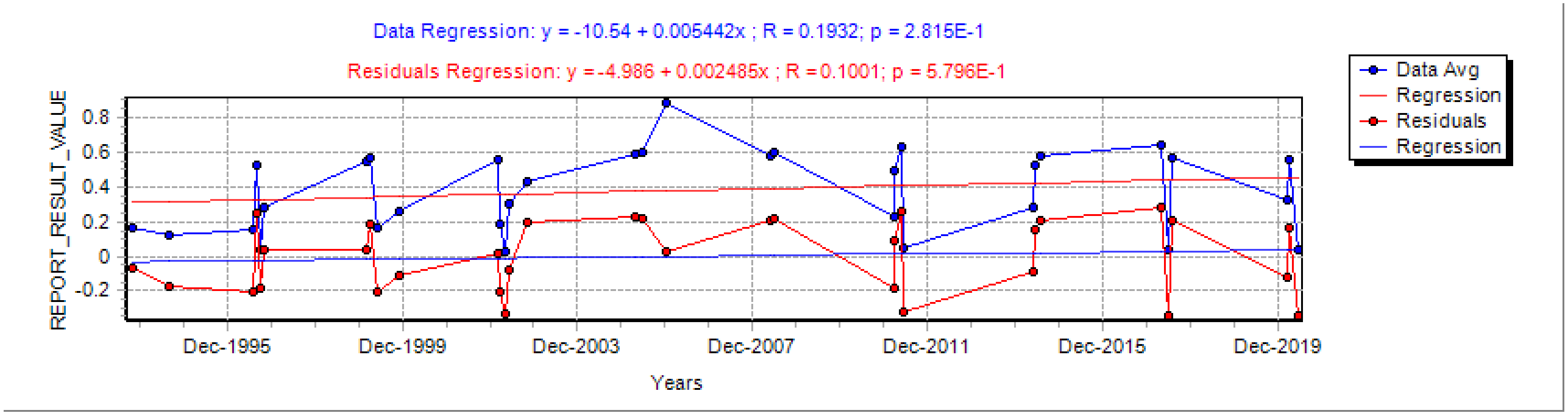



## Chart 10-3: Specific Conductance Trend

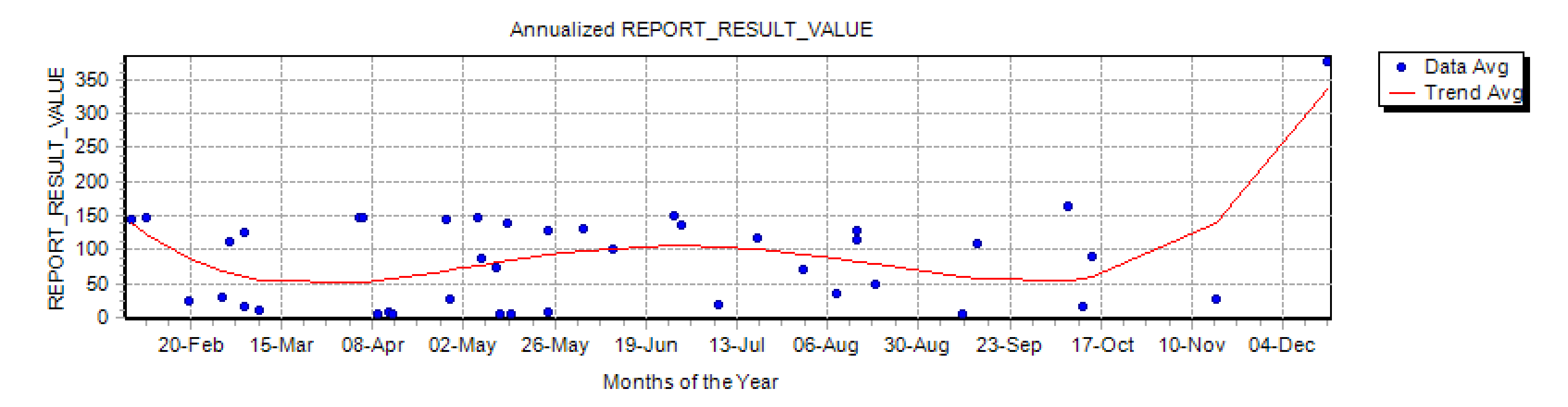


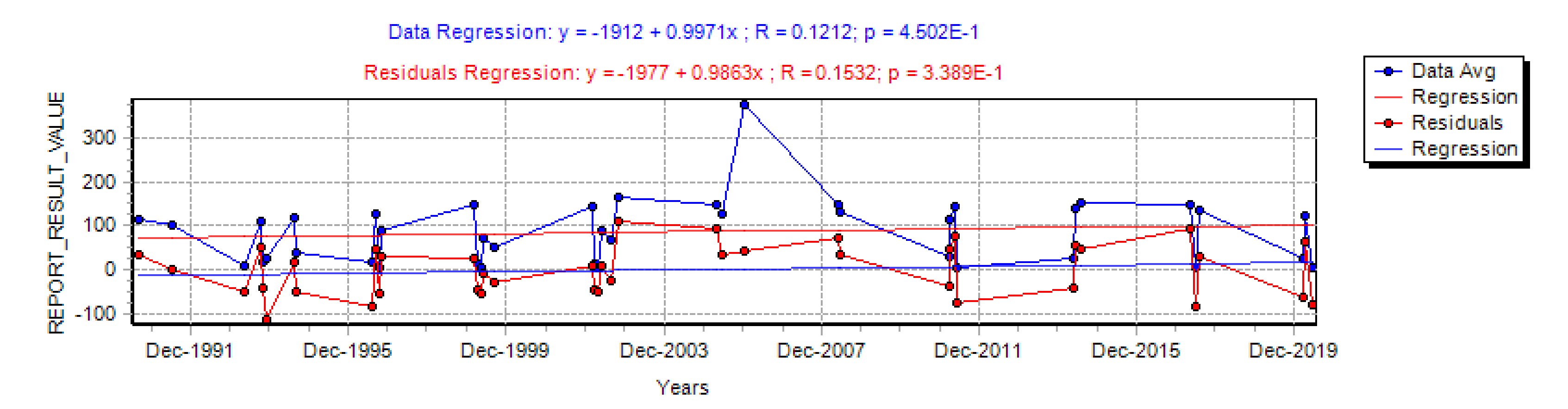
## Chart 10-4: Field Salinity Trend



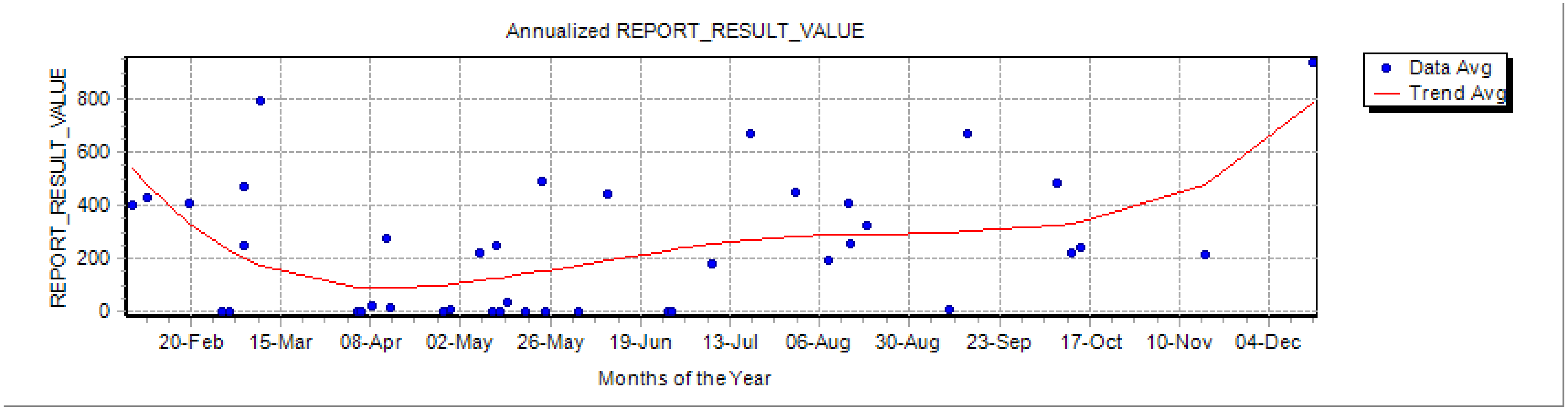



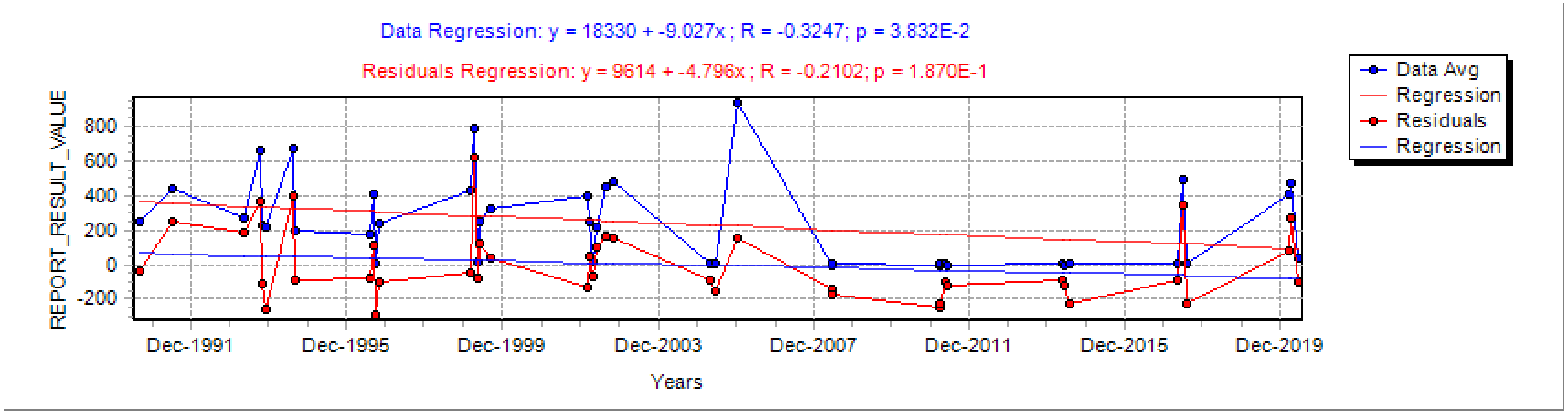
## Chart 10-5: Chloride Trend



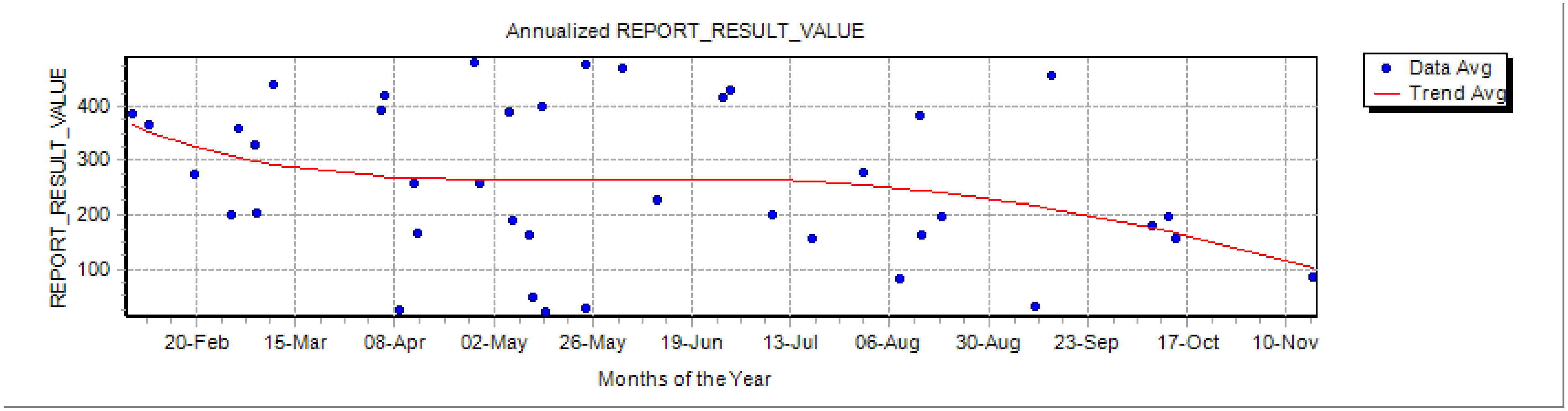



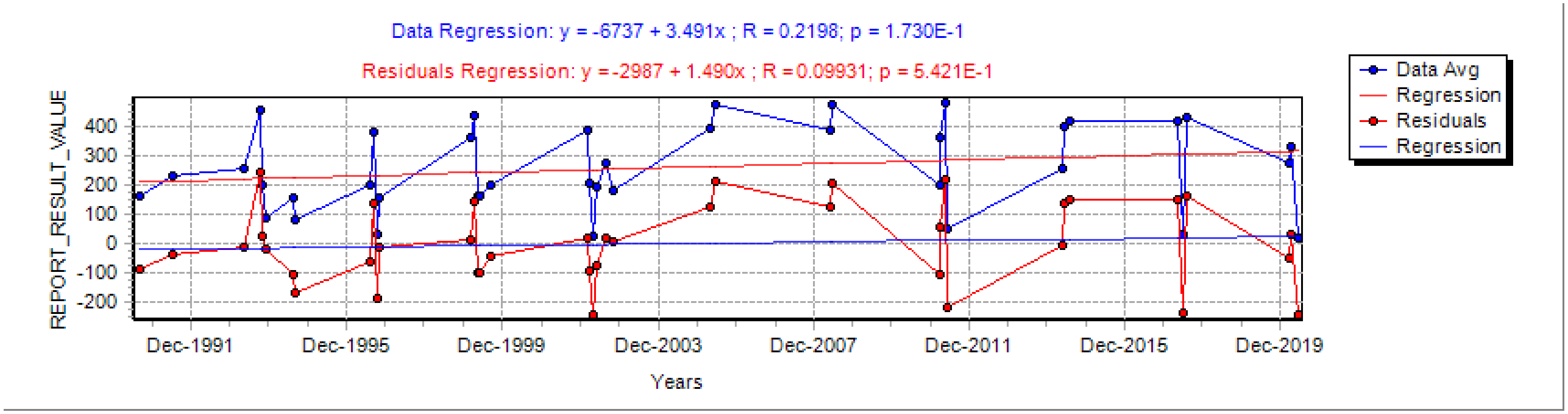
## *Chart 10-6: Total Dissolved Solids Trend*



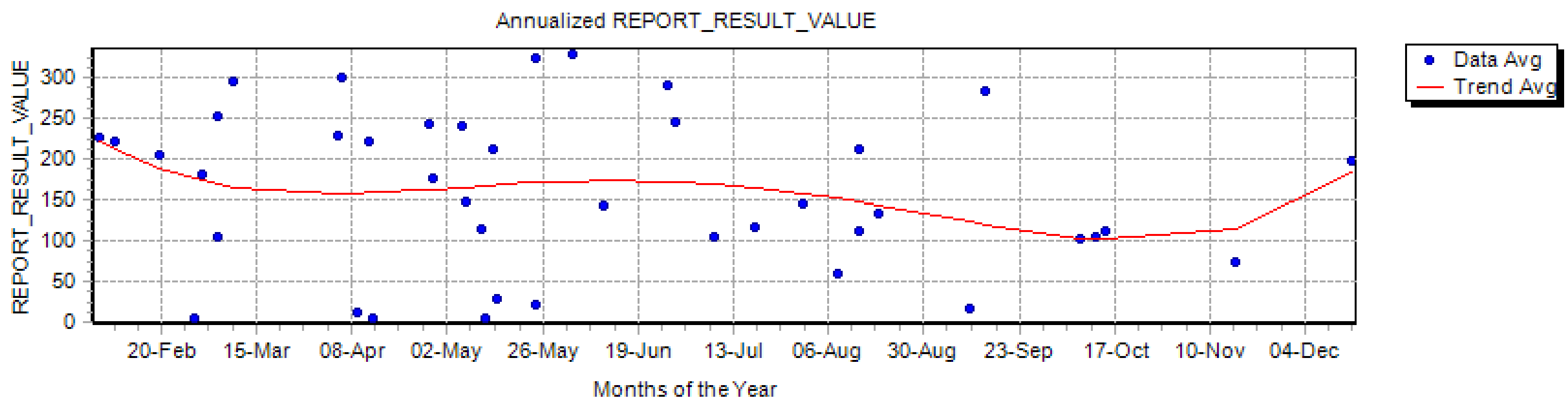



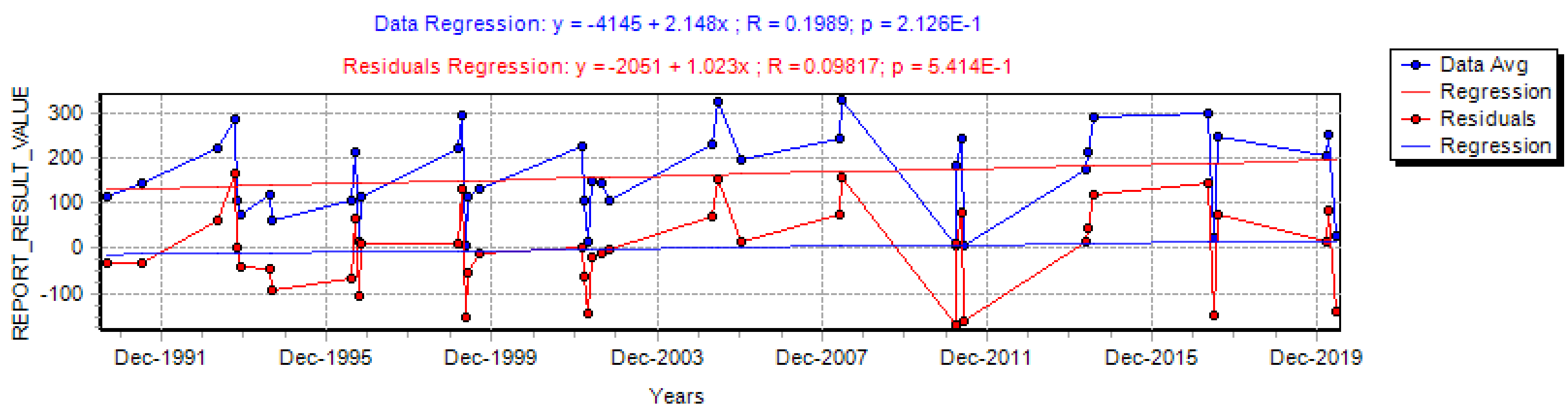
## *Chart 10-7: Alkalinity Trend*



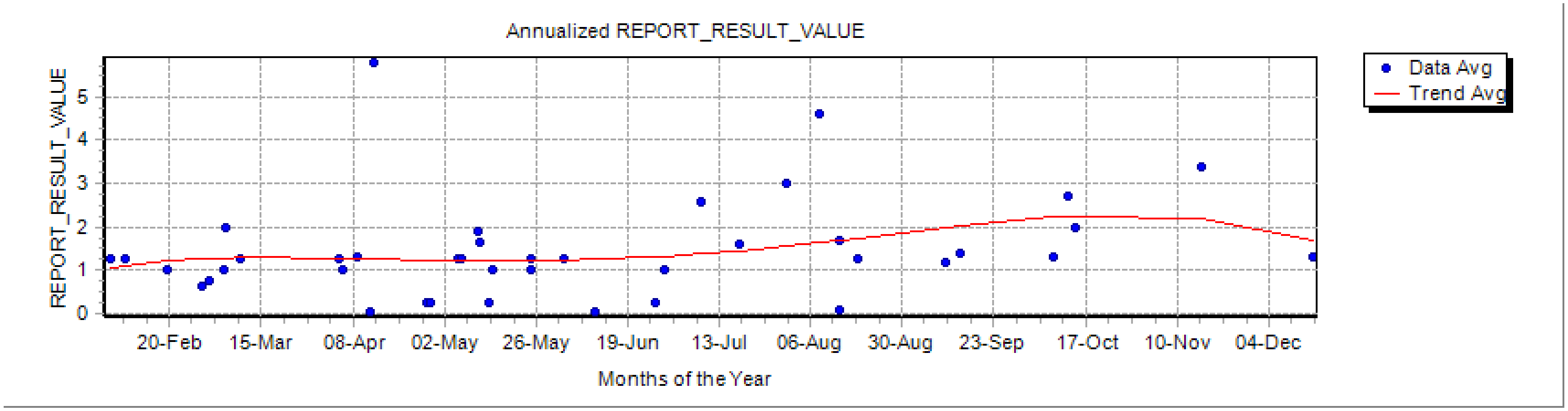



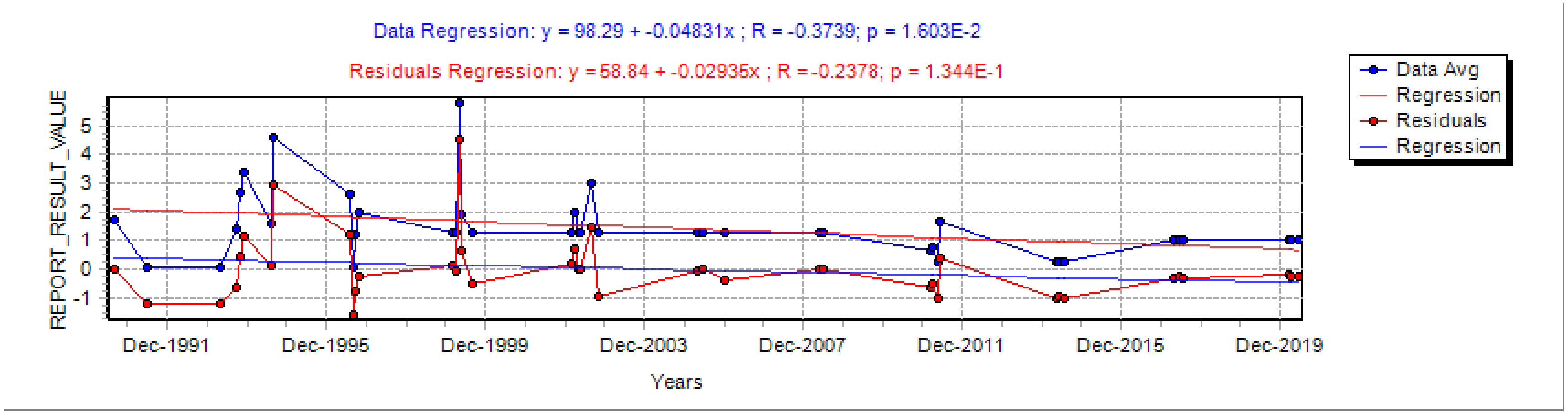
## *Chart 10-8: Hardness Trend*



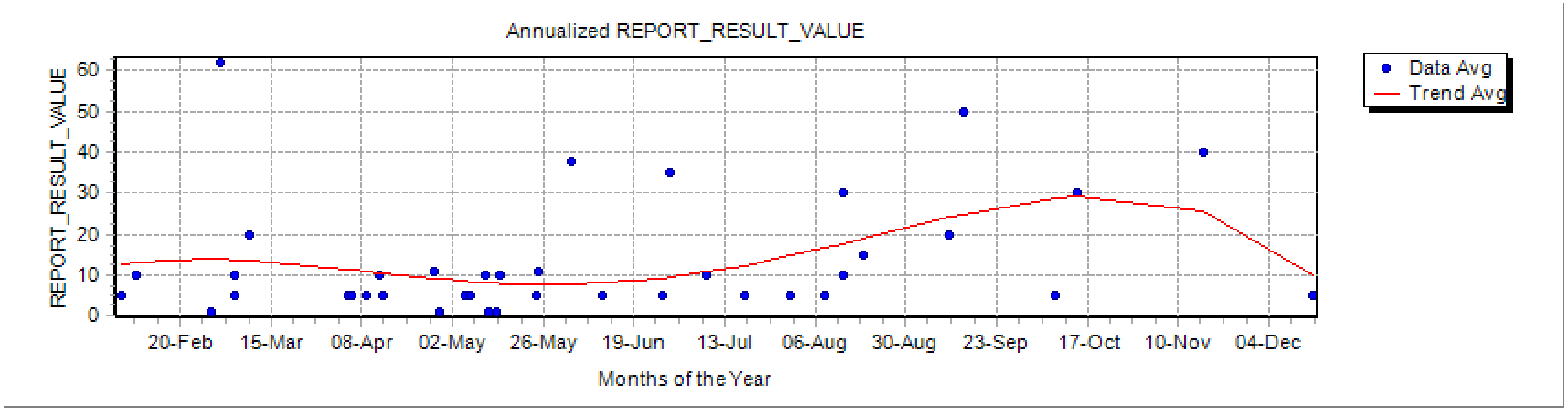



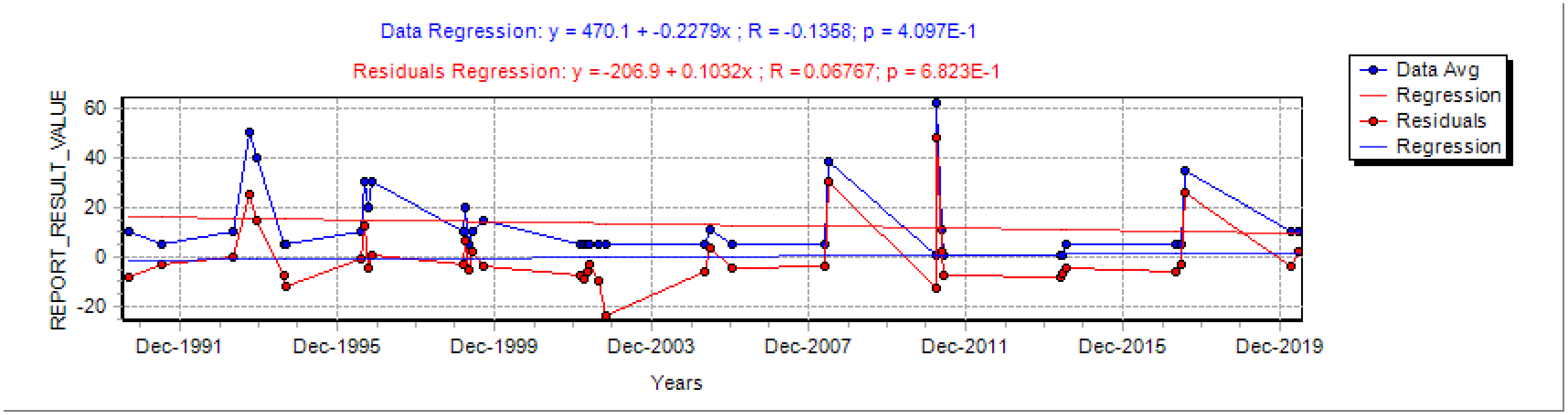
## *Chart 10-9: Sulfate Trend*



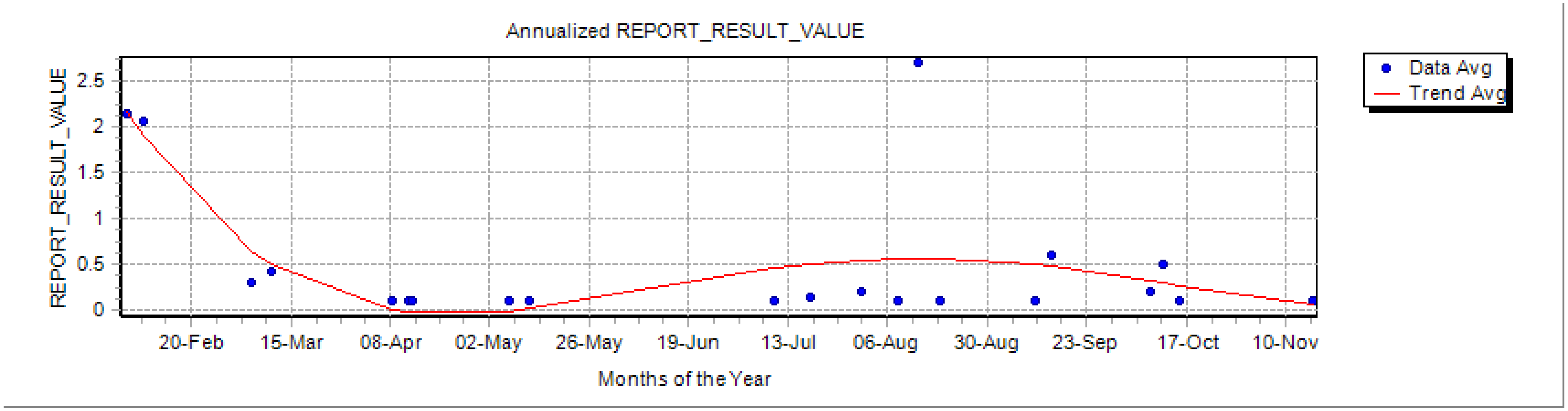



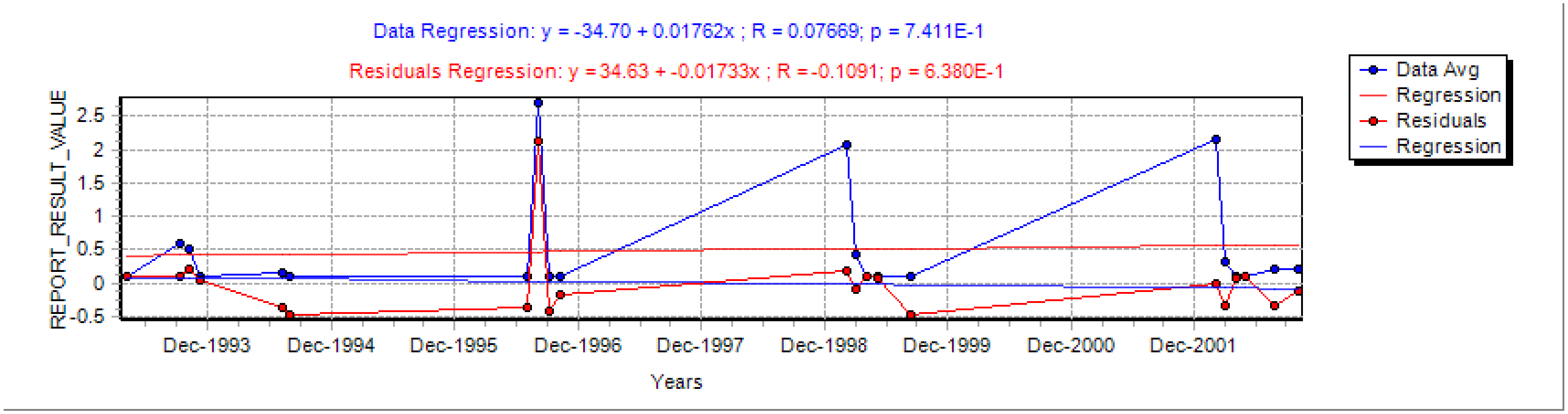
## *Chart 10-10: Color Trend*



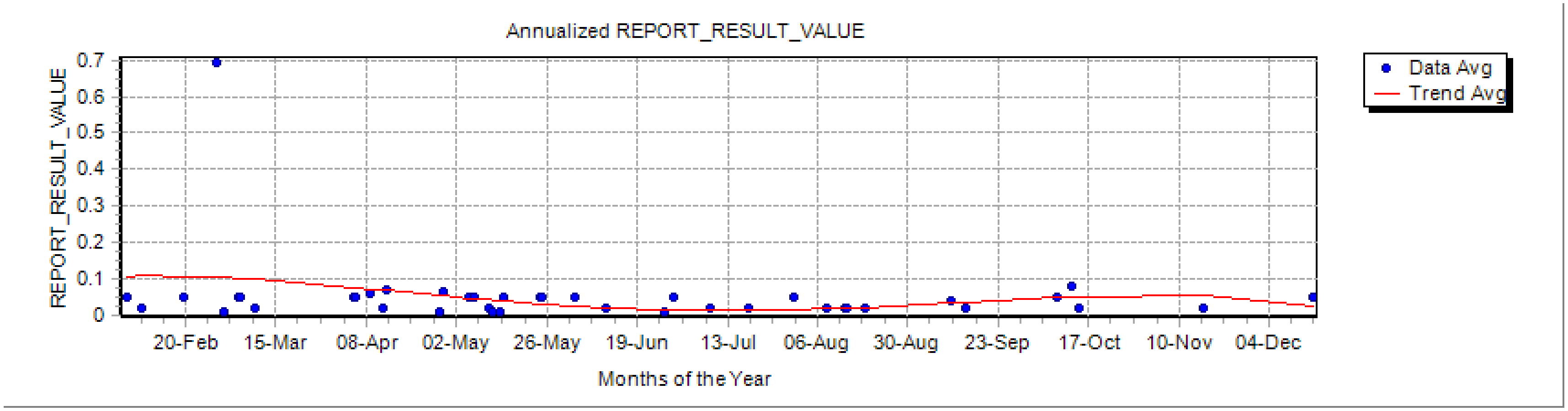



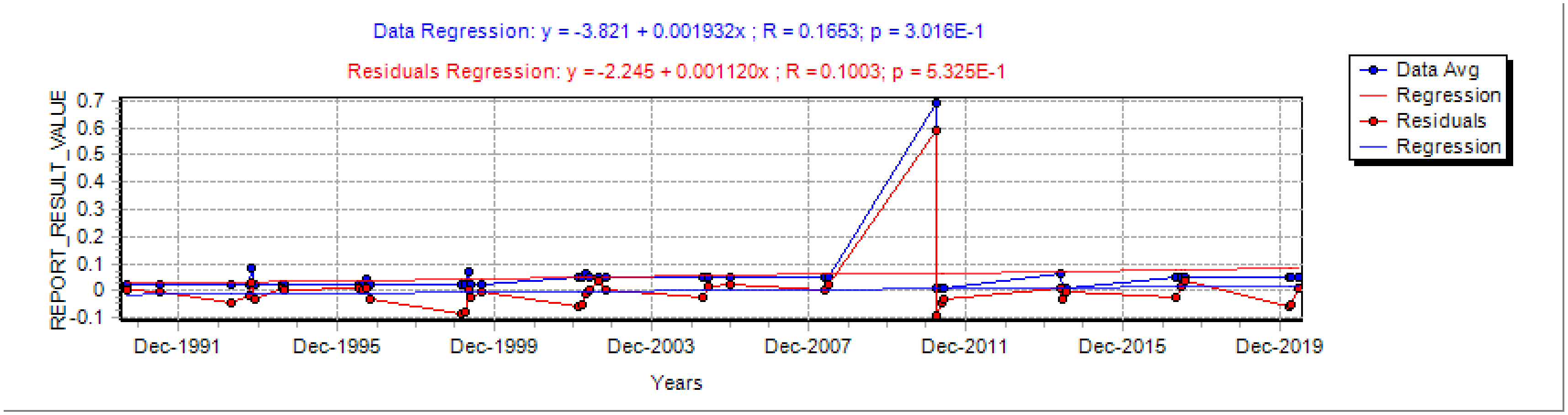
## *Chart 10-11: Ammonia Trend*



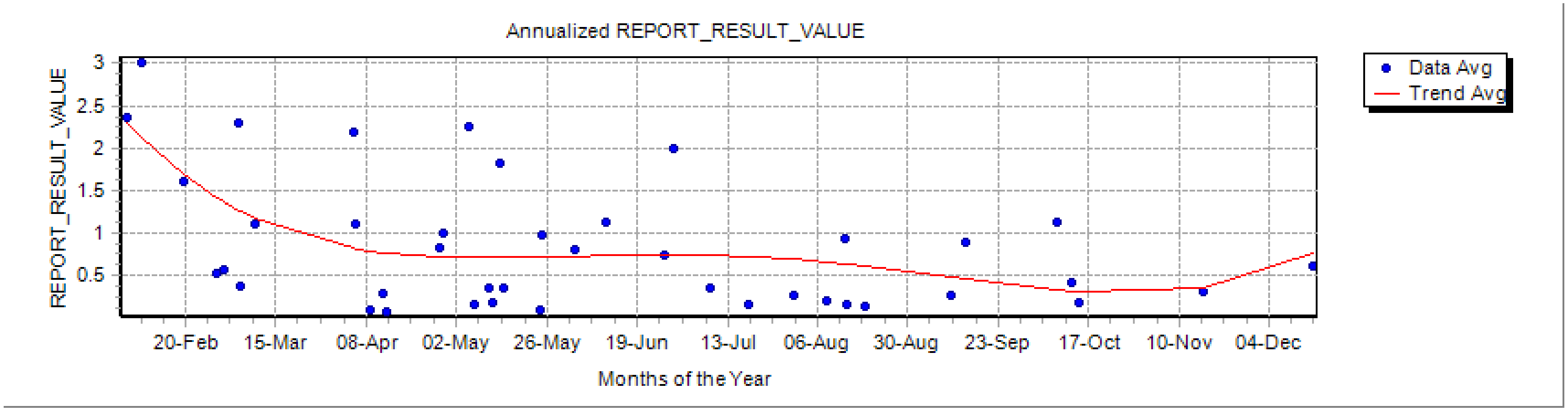



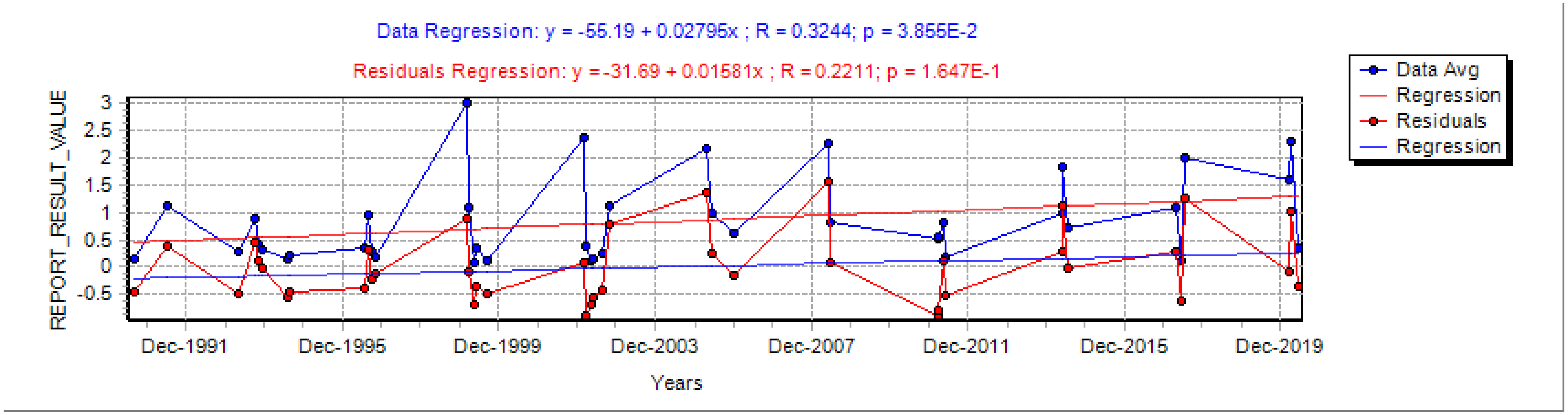
## *Chart 10-12: Nitrate – Nitrite Trend*



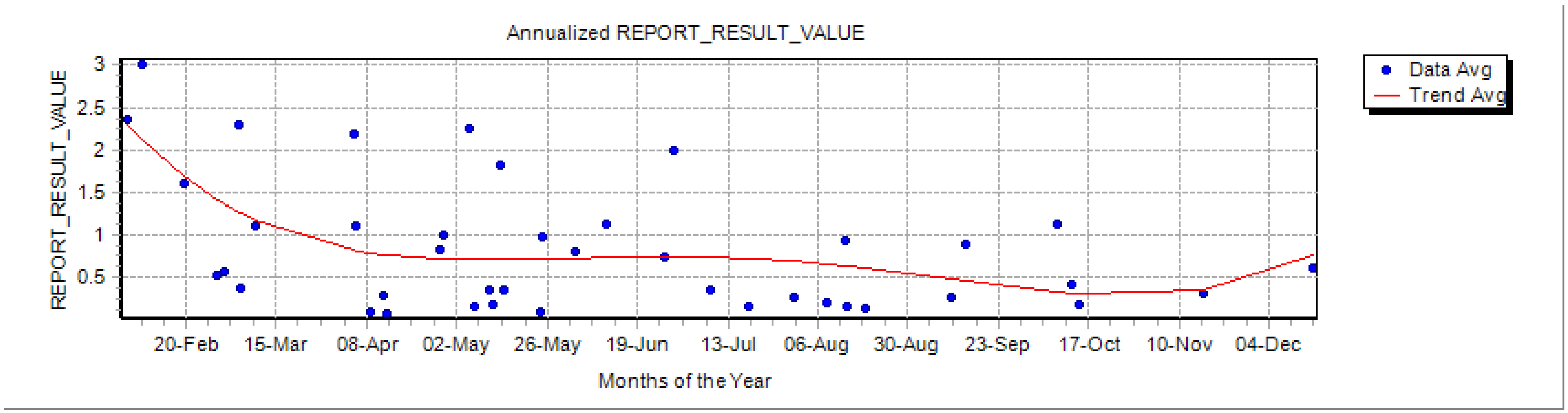



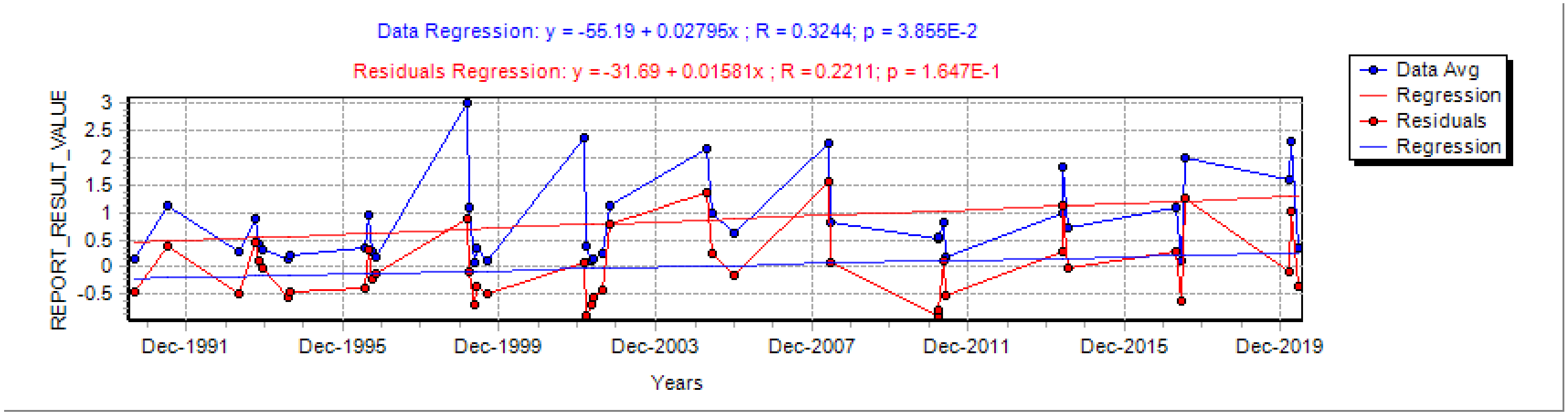
## *Chart 10-13: Total Kjeldahl Nitrogen Trend*



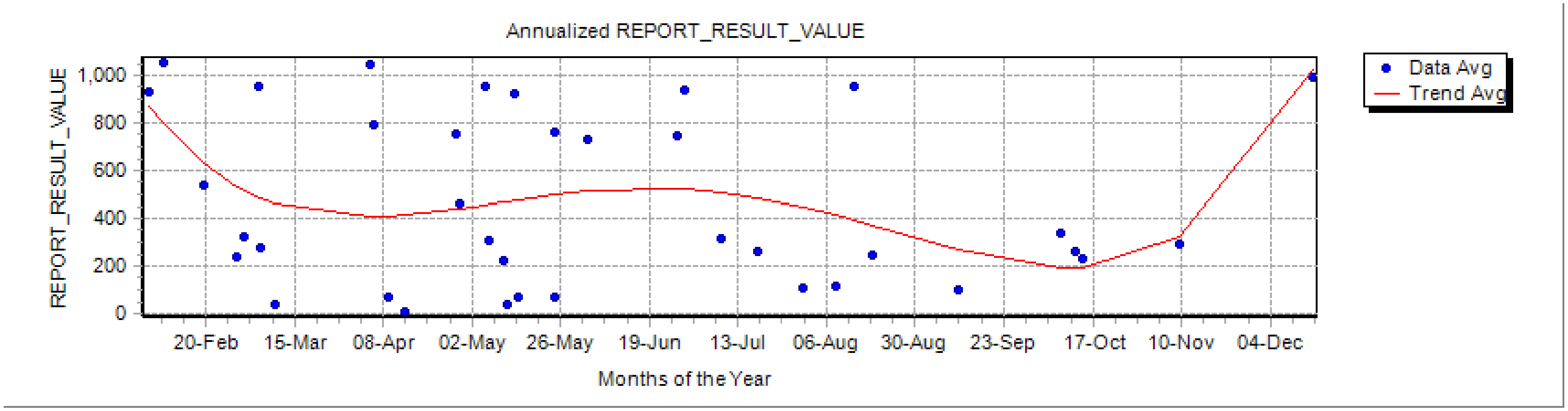



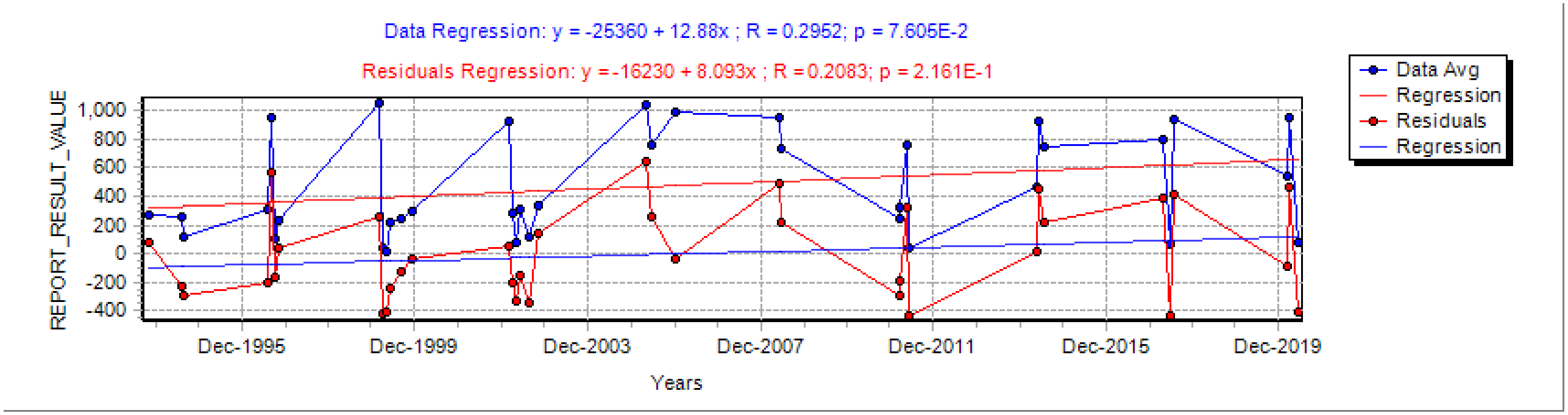
## *Chart 10-14: Total Phosphorus Trend*



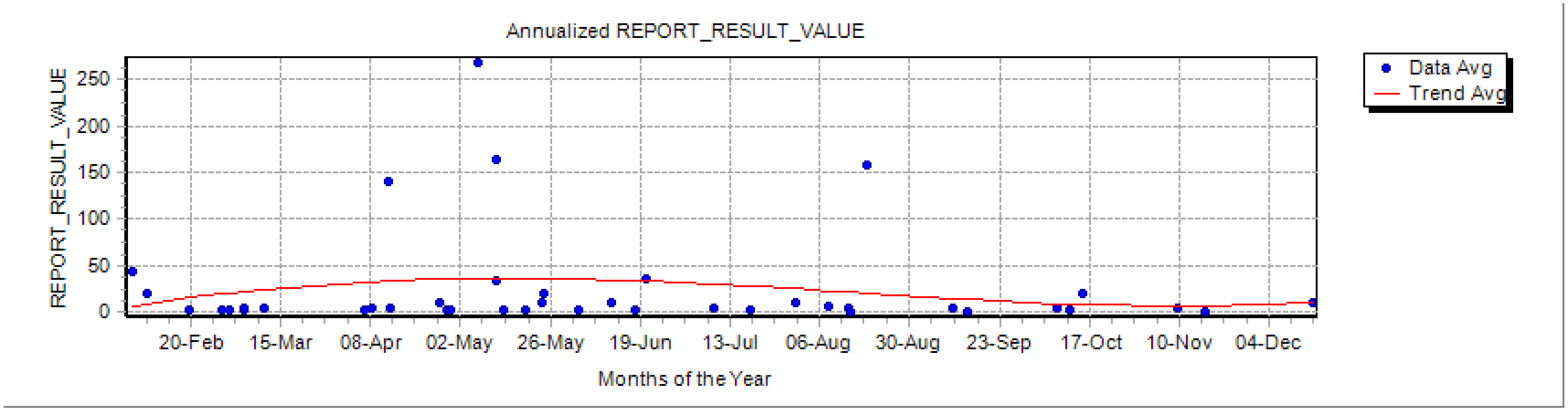



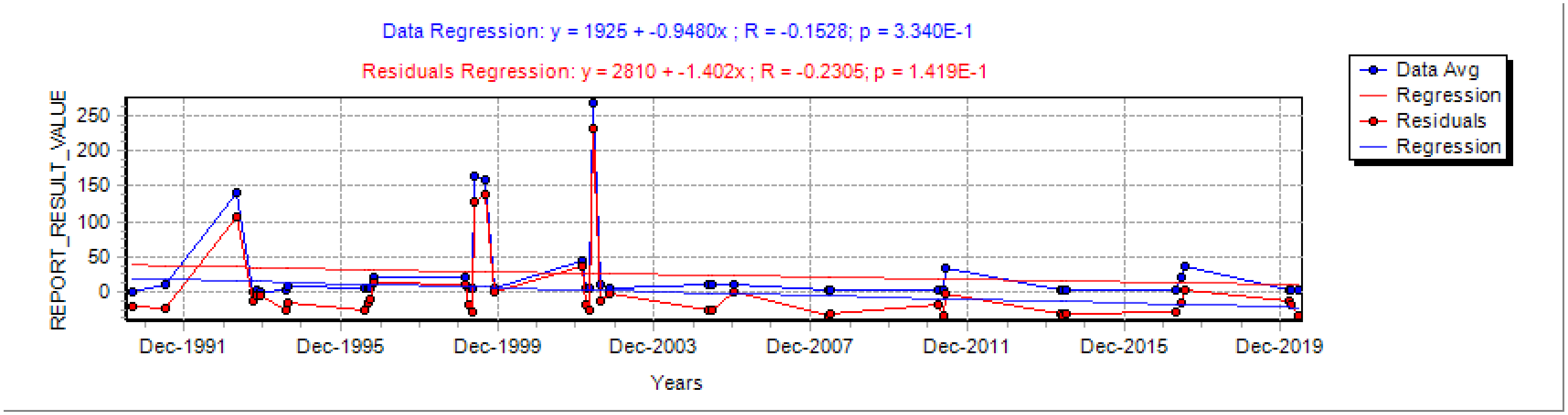
## Chart 10-15: Barium Trend



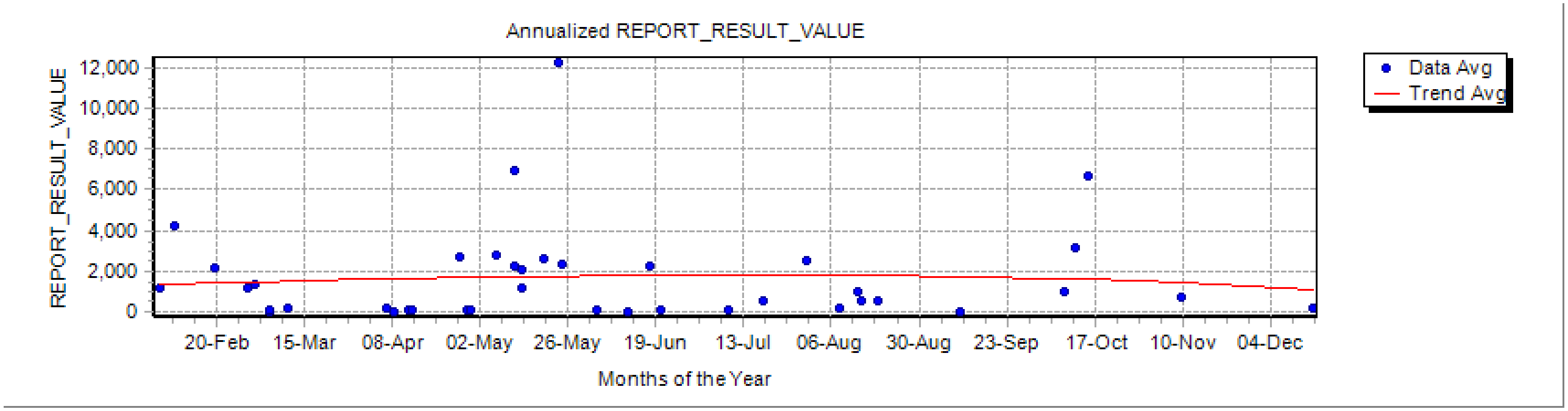



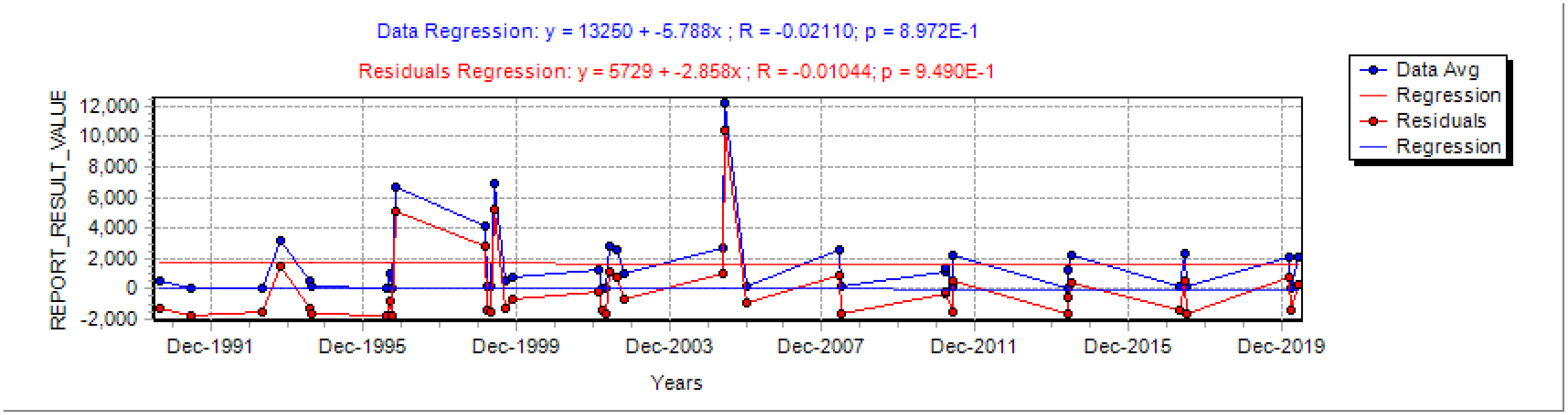
## *Chart 10-16: Copper Trend*



## Chart 10-17: Iron Trend



## *Chart 10-18: Zinc Trend*