Appendix F - 3

Box-Plots of Pit Lake, Surface Water and Groundwater Data

Methodology Used to Construct Boxplots of Water Concentration Data from the Pit Area

This writeup documents the methodology used to construct boxplots of water concentration data from the Pit Area.

Boxplots were produced for:

- Concentrations by location
- Concentrations by depth in the Pit Lake

Raw data from the database are given in the attached electronic file "Nadine-PitWaterFinal.xls".

Analytes that were included in the analysis include:

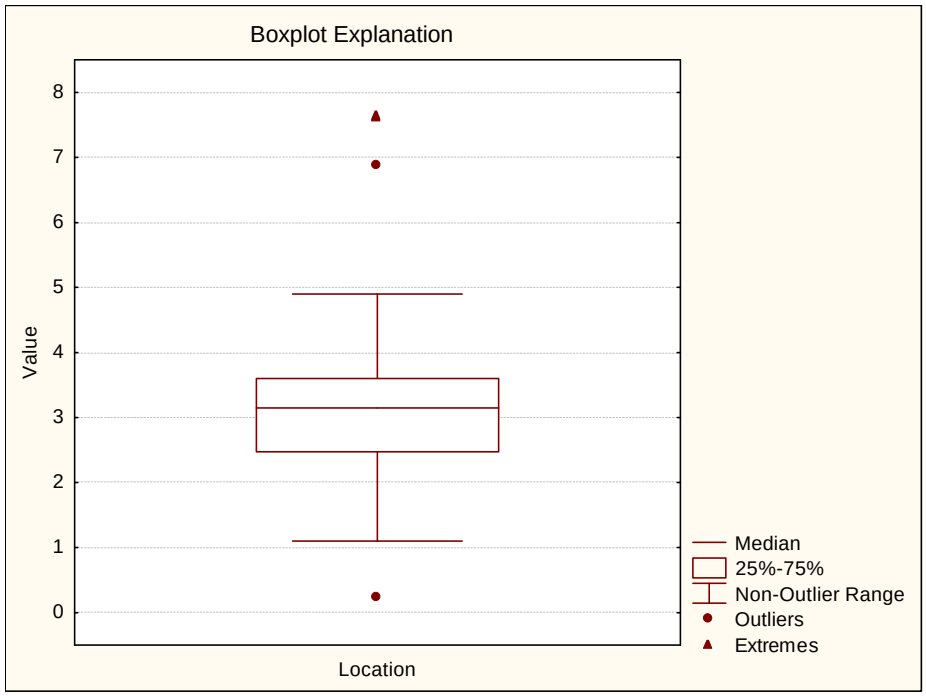
Analyte Name	Analyte Abbreviation	Units	Grouping
Calcium	CA	mg/L	Water Quality Parameters and Major Ions
Chloride	CL	mg/L	Water Quality Parameters and Major Ions
Fluoride	F	ug/L	Water Quality Parameters and Major Ions
Magnesium	MG	mg/L	Water Quality Parameters and Major Ions
Nitrate as N	NO3N	mg/L	Water Quality Parameters and Major Ions
pH	PH	SU	Water Quality Parameters and Major Ions
Potassium	K	mg/L	Water Quality Parameters and Major Ions
Sodium	NA	mg/L	Water Quality Parameters and Major Ions
Sulfate	SO4	mg/L	Water Quality Parameters and Major Ions
Total Dissolved Solids	TDS	mg/L	Water Quality Parameters and Major Ions
Aluminum	AL	ug/L	Metals
Arsenic	AS	ug/L	Metals
Barium	BA	ug/L	Metals
Beryllium	BE	ug/L	Metals
Cadmium	CD	ug/L	Metals
Copper	CU	ug/L	Metals
Iron	FE	ug/L	Metals
Lithium	LI	ug/L	Metals
Manganese	MN	ug/L	Metals
Molybdenum	MO	ug/L	Metals
Selenium	SE	ug/L	Metals
Zinc	ZN	ug/L	Metals
Radium-226	RA-226	Pci/L	Radiochemicals
Radium-228	RA-228	Pci/L	Radiochemicals
Strontium	SR	ug/L	Radiochemicals
Thorium-228	TH-228	Pci/L	Radiochemicals
Thorium-230	TH-230	Pci/L	Radiochemicals
Thorium-232	TH-232	Pci/L	Radiochemicals
Uranium	U-CONC	ug/L	Radiochemicals

Nondetects were set equal to one-half the reporting limit for production of the boxplots..

Data for metals and radiochemicals were only included if information was available regarding their “total” or “dissolved” status. Total and dissolved concentrations were plotted on separate graphs, where a graph is a set of related boxplots. Separate graphs were also prepared with and without nondetects. Therefore, four graphs were prepared for each constituent.

A single graph was prepared for each analyte in the “water quality parameters and major ions” group. These data had very few nondetect observations.

The type of boxplot used in this analysis is the standard boxplot. The box itself contains the center 50 percent of the data (i.e., the interquartile range), and the median is indicated as a horizontal line within the box. The top edge of the box is the 75th percentile and the bottom edge is the 25th percentile. Vertical lines, sometimes called whiskers, extend to the last observation within one step beyond either end of the box. A step is 1.5 times the height of the box. Data points that fall outside one step are considered to be “outliers”, and values that fall outside of two steps are labeled “extreme”. Outliers and extremes are individually plotted. Boxplots were constructed using Statistica (StatSoft, 2005). A key is given below:



Concentrations by Location

Boxplots were prepared using data from the locations listed below, and in the order shown.

Location Name	West Highwall Spring	WW-59	B/W-13	Pit Lake	Walker River	B/W-15	B/W-14	WW-36	WW-40	East Highwall Spring
Location Abbreviation	WHS	WW-59	B/W-13	PL	WR	B/W-15	B/W-14	WW-36	WW-40	EHS

Data from all time periods were included for WHS, PL and EHS. Data were used through the 2nd quarter 2007 sampling event for the WW and B/W wells, because data from the 3rd quarter were still being validated at the time of this evaluation. Walker River data were collected from July 1994 through May 2004.

Boxplots of concentrations by location are shown in Figures 1, 2 and 3 for "water quality parameters and major ions", "metals", and "radiochemicals", respectively.

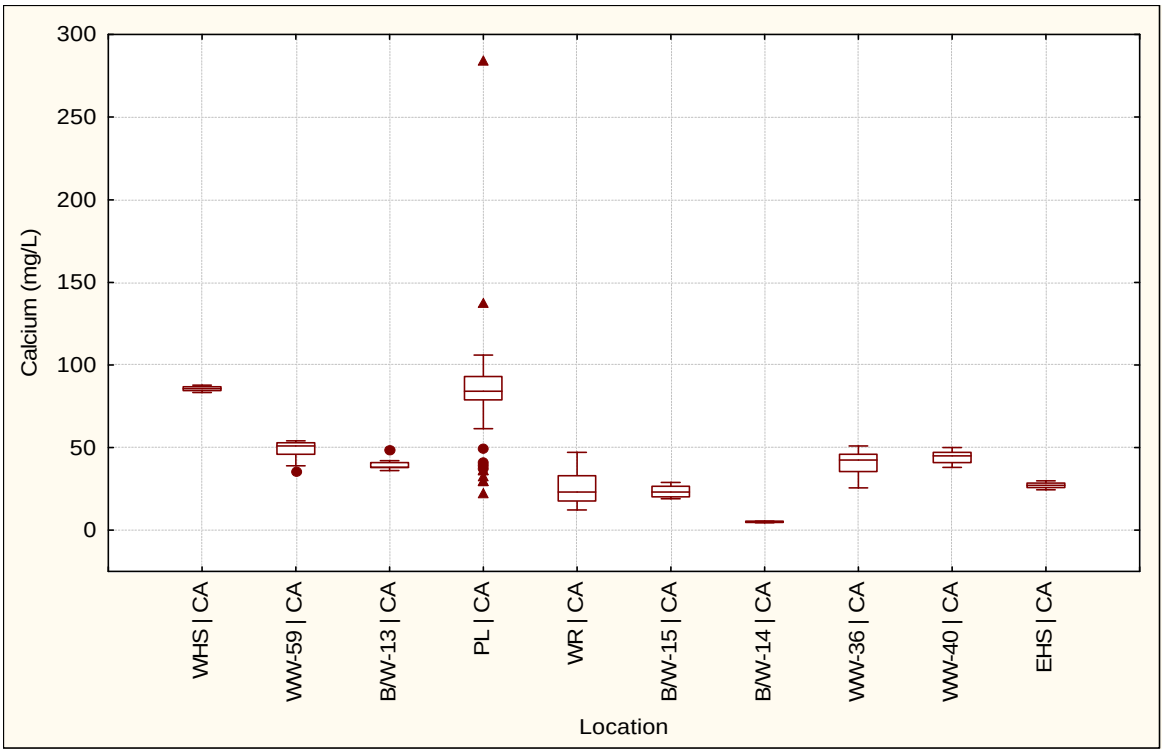
Concentrations by Depth in the Pit Lake

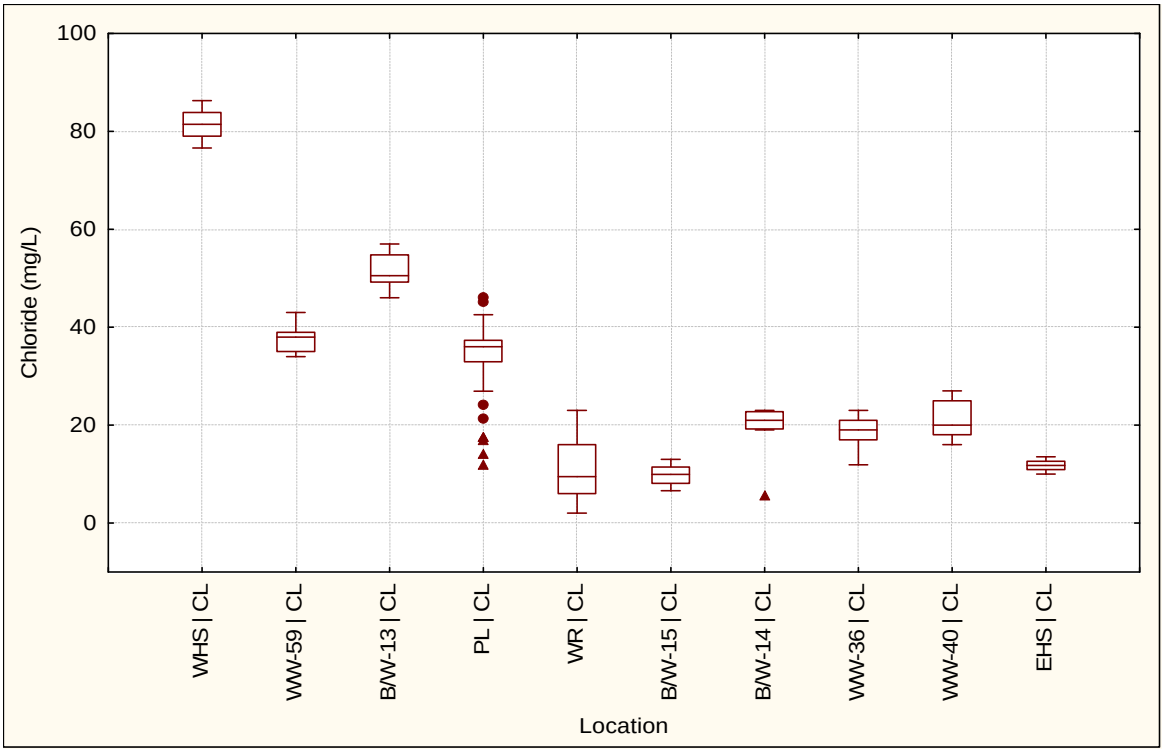
Data prior to May 1998 was not included in the boxplots of concentrations by depth in the Pit Lake. Boxplots are shown in Figures 4 and 5 for "water quality parameters, major ions, and radiochemicals", and "metals", respectively.

References

StatSoft, Inc. 2005. STATISTICA for Windows. Version 7.1**,** at http://www.statsoft.com.

Figure 1. Boxplots of Water Quality Parameters and Major Ions





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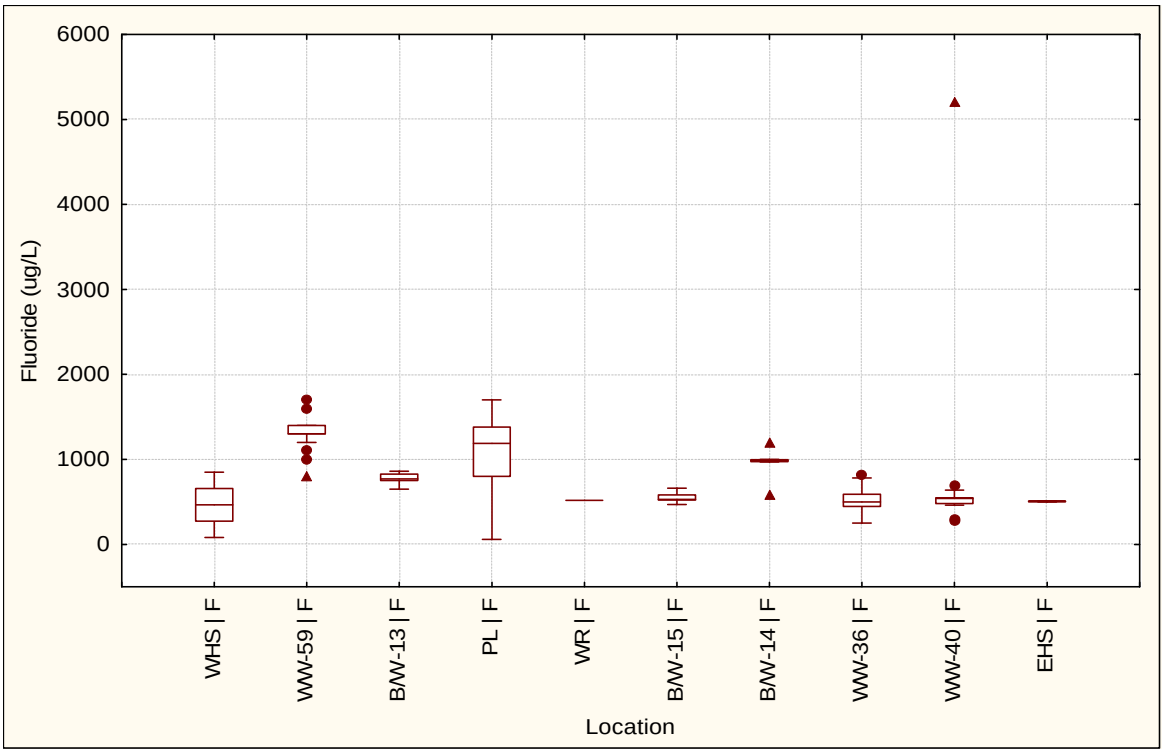

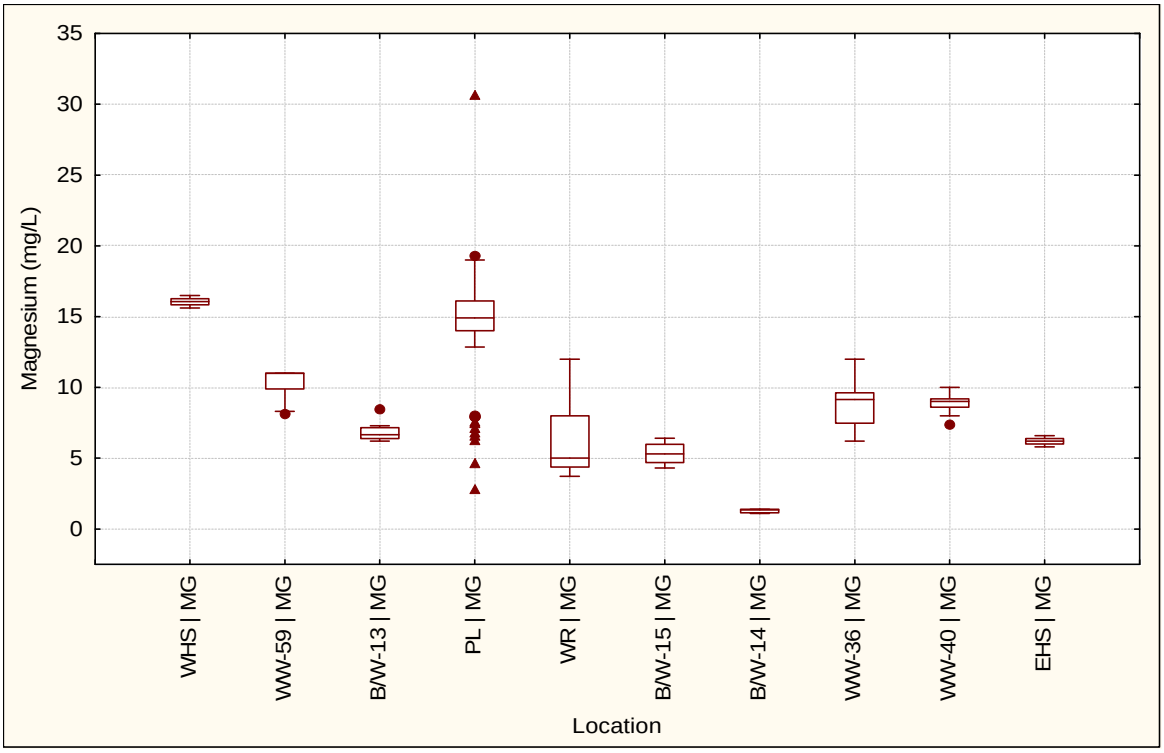

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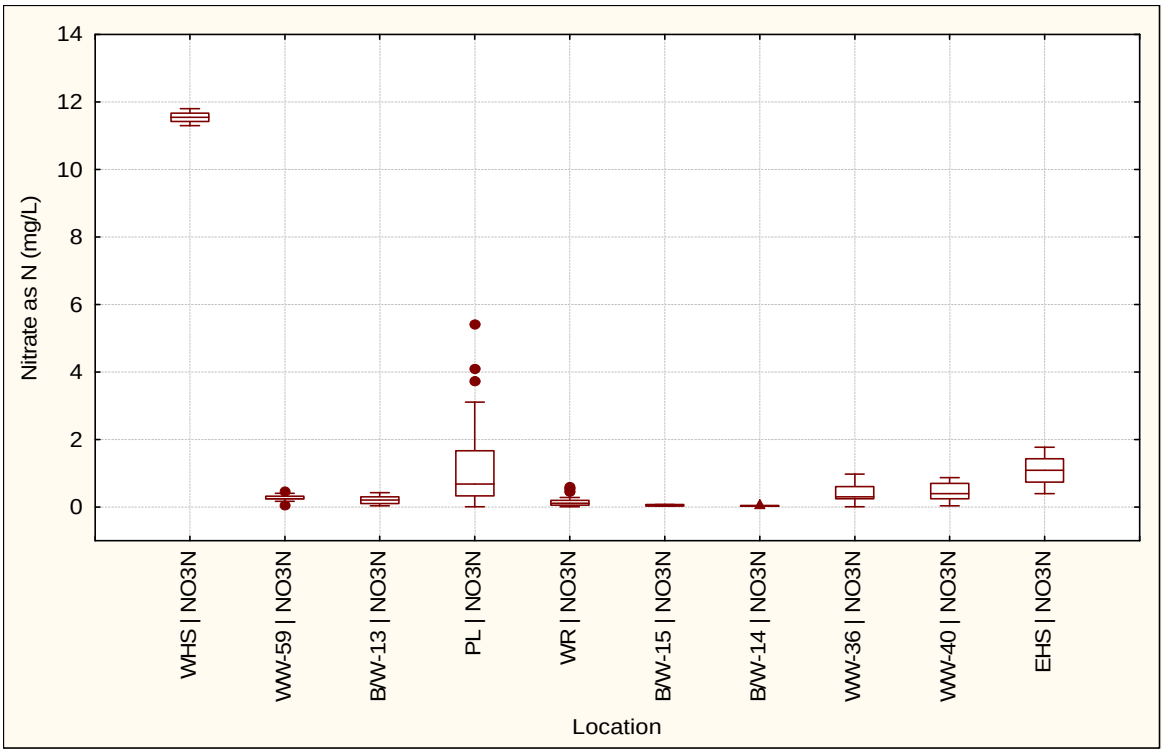

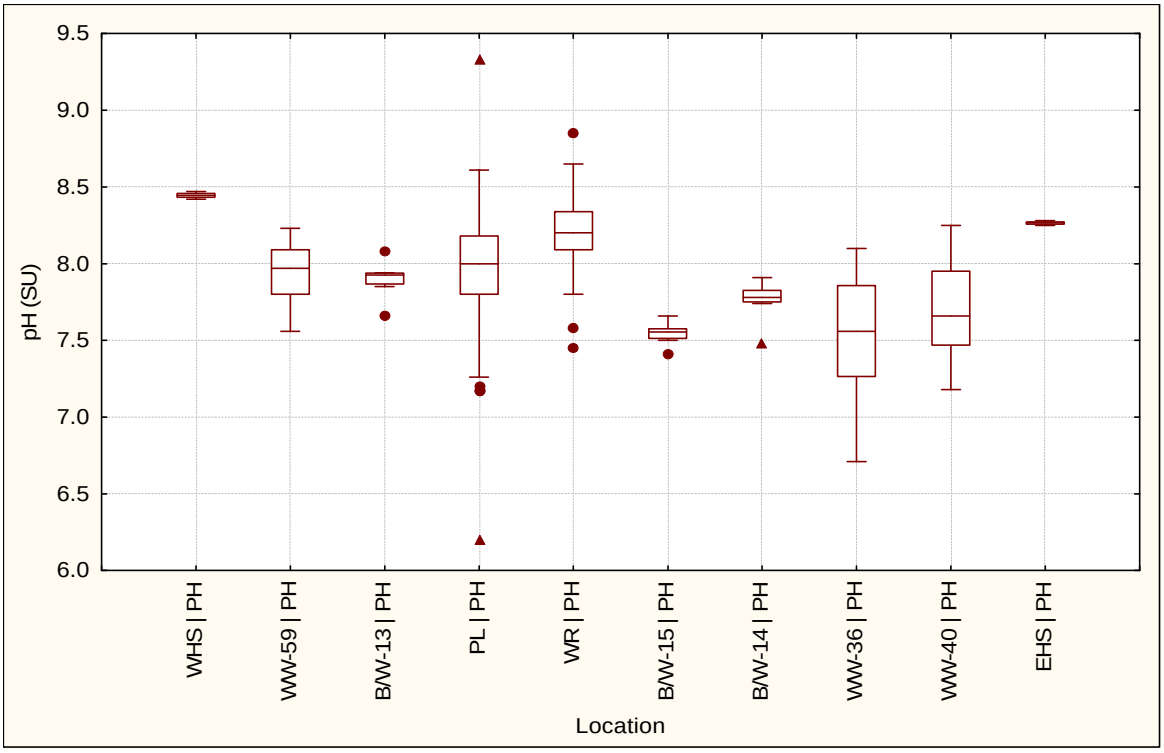

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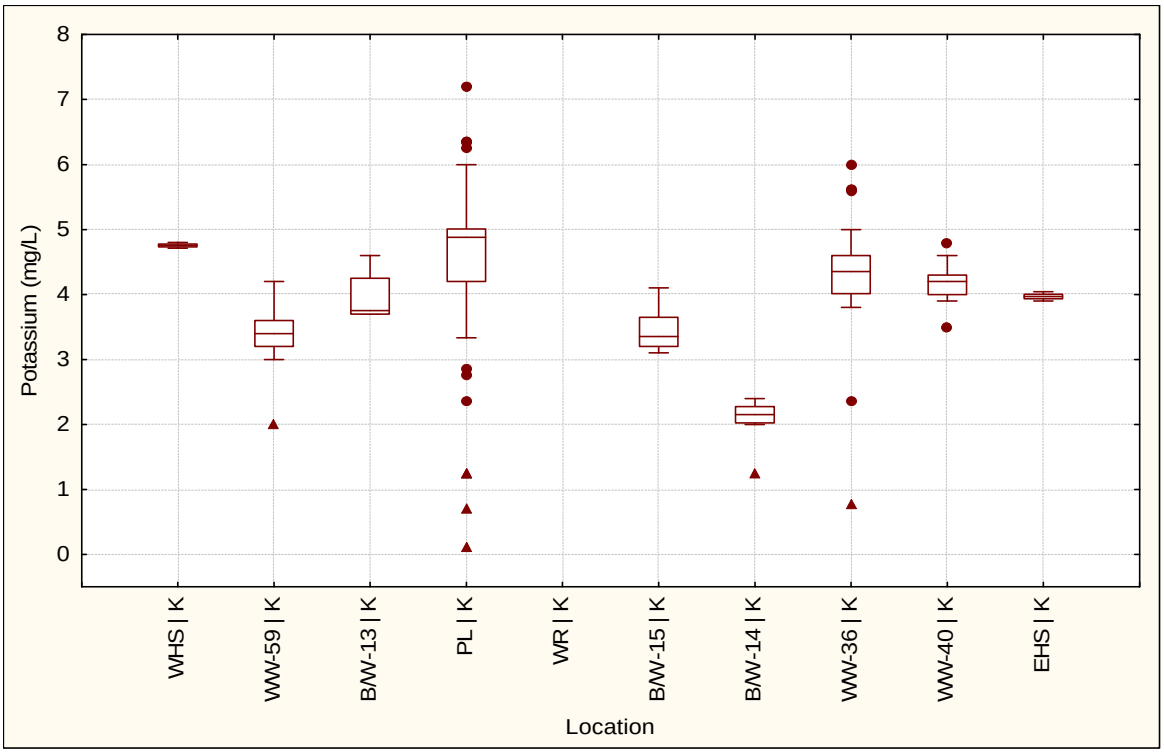

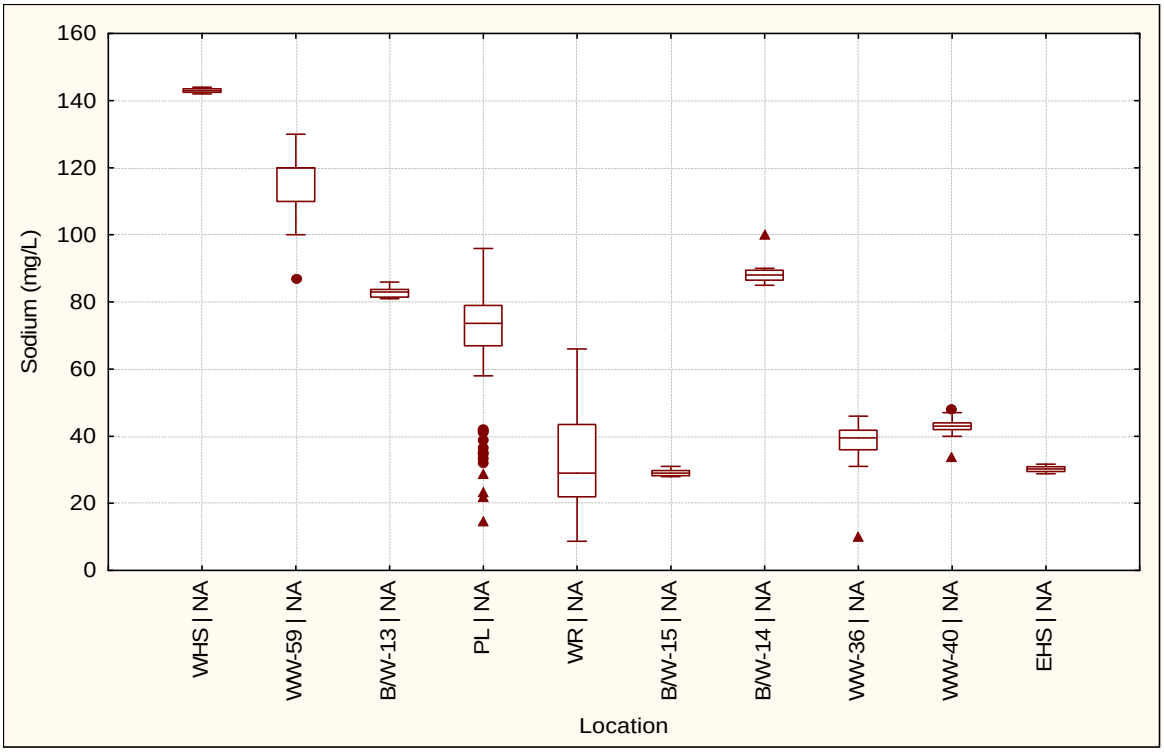

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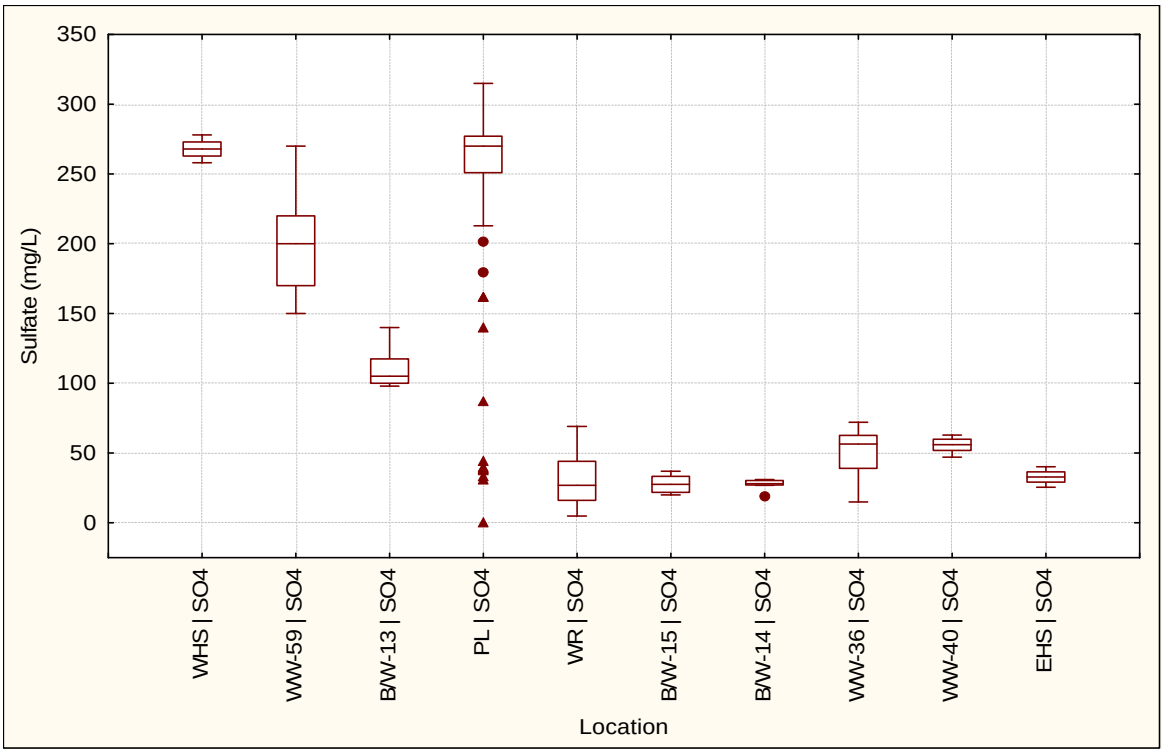

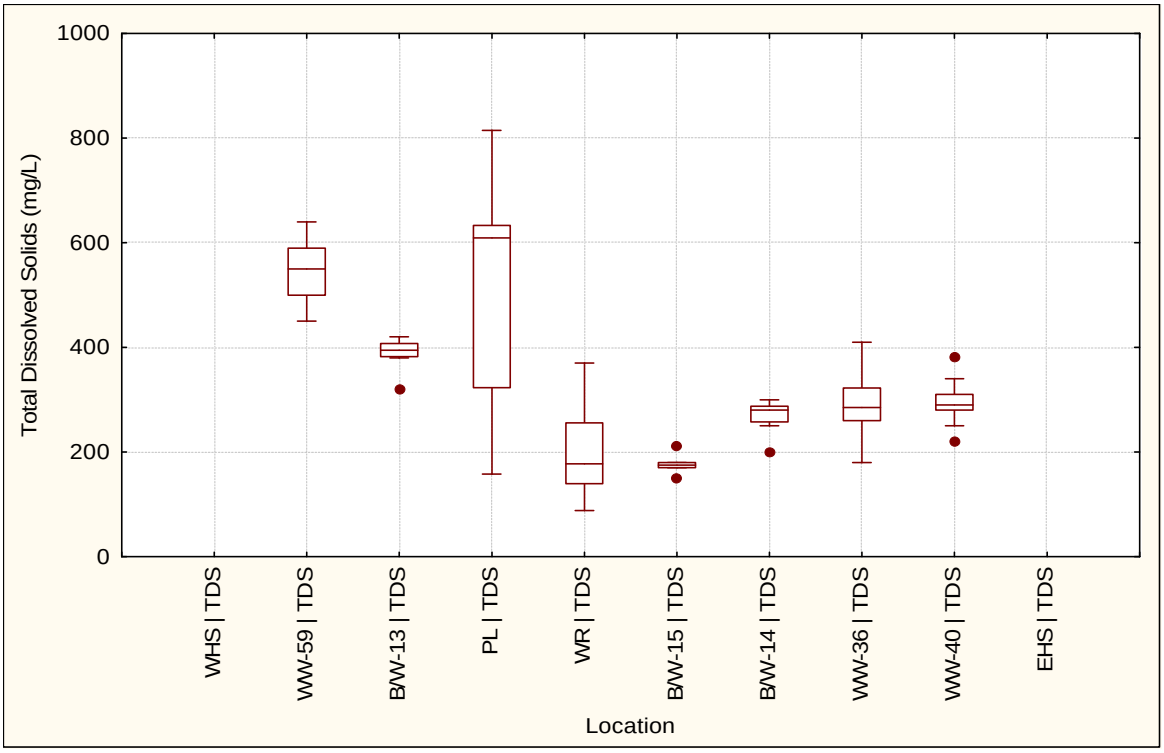

Figure 2. Boxplots of Metals

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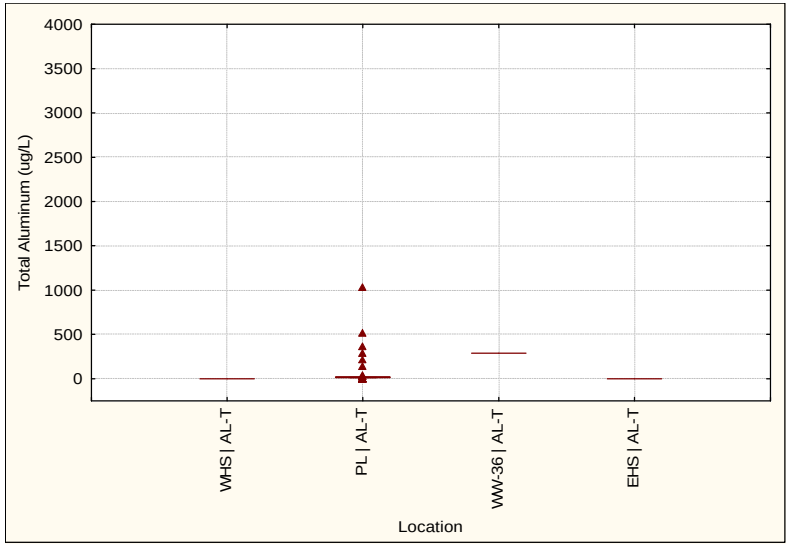

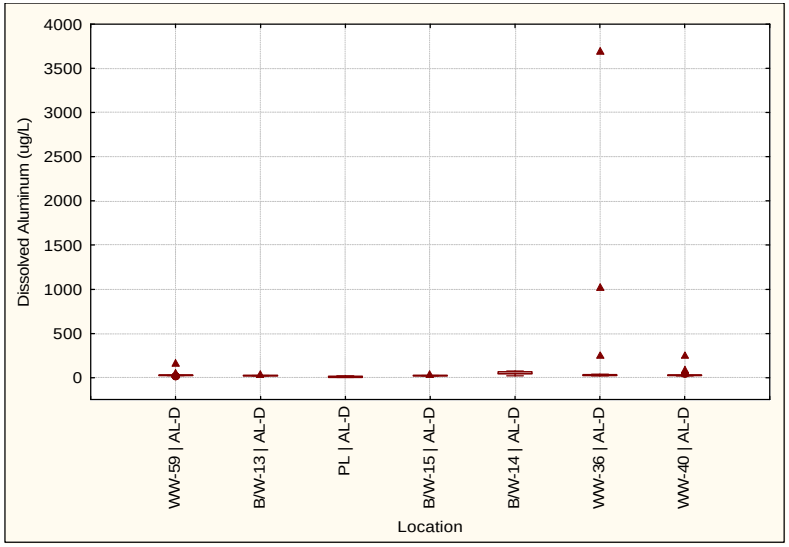

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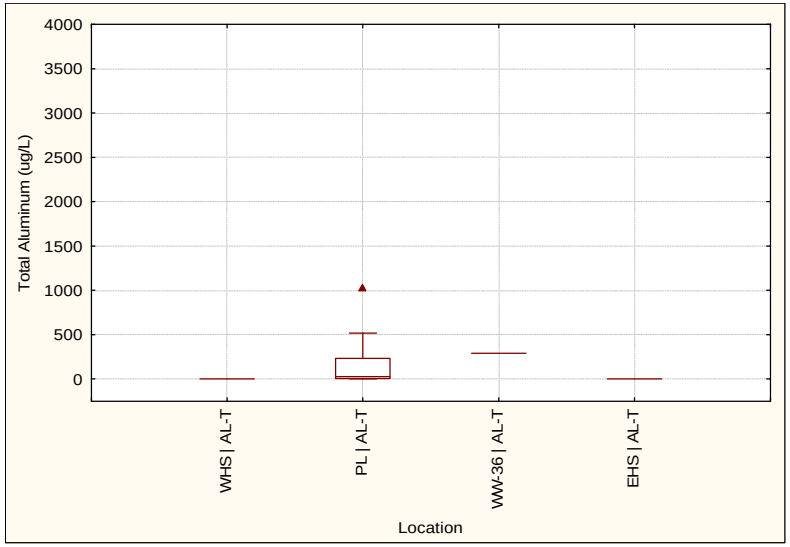

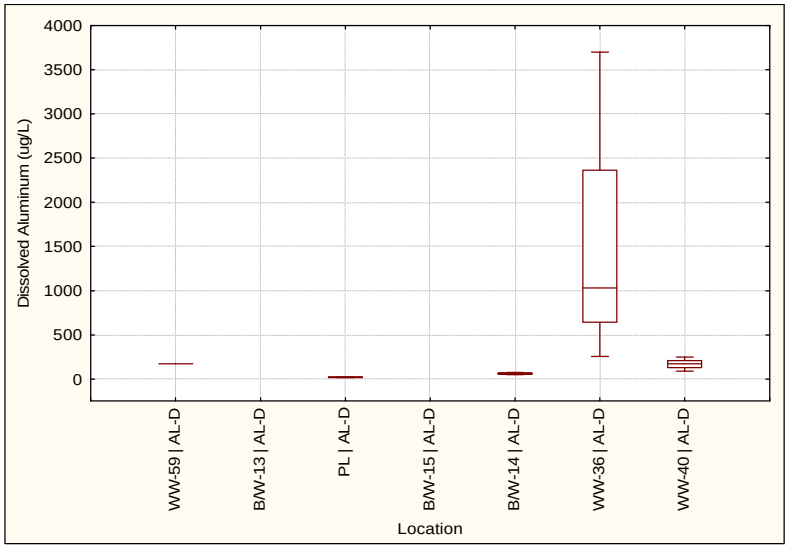

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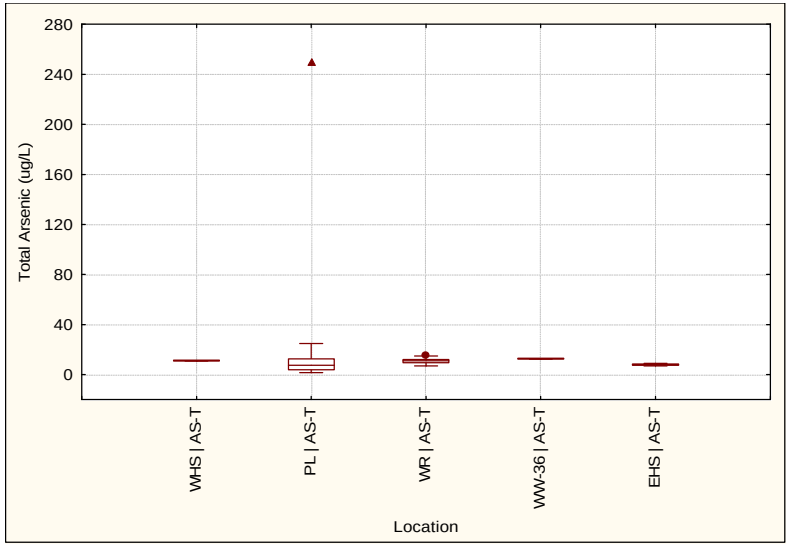

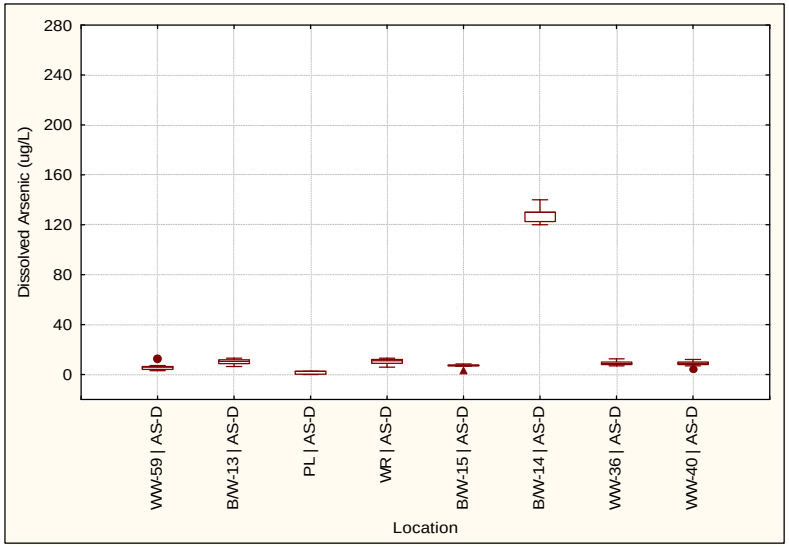

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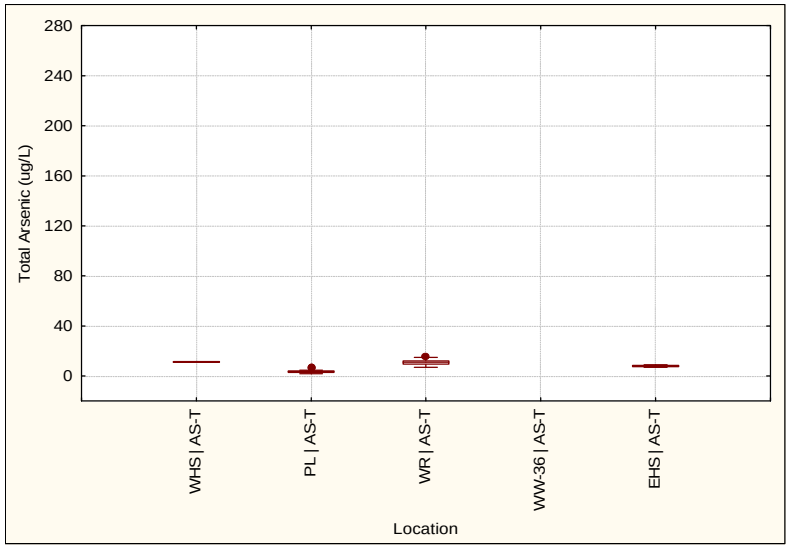

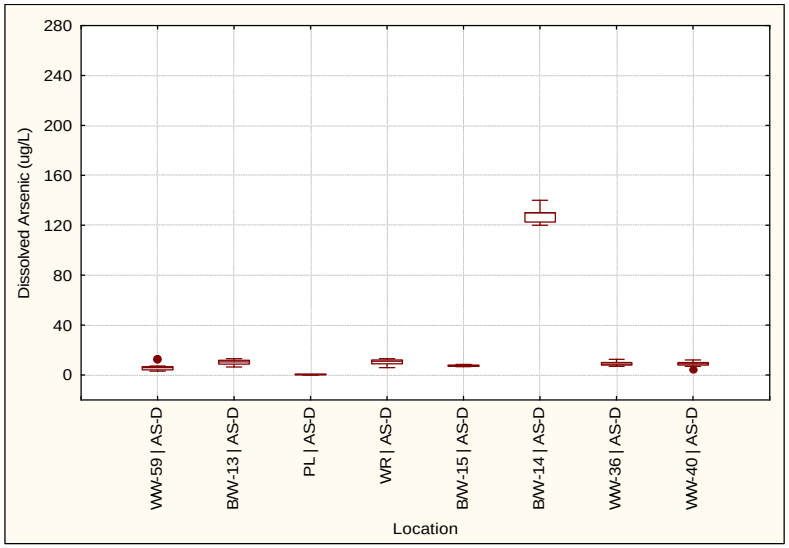

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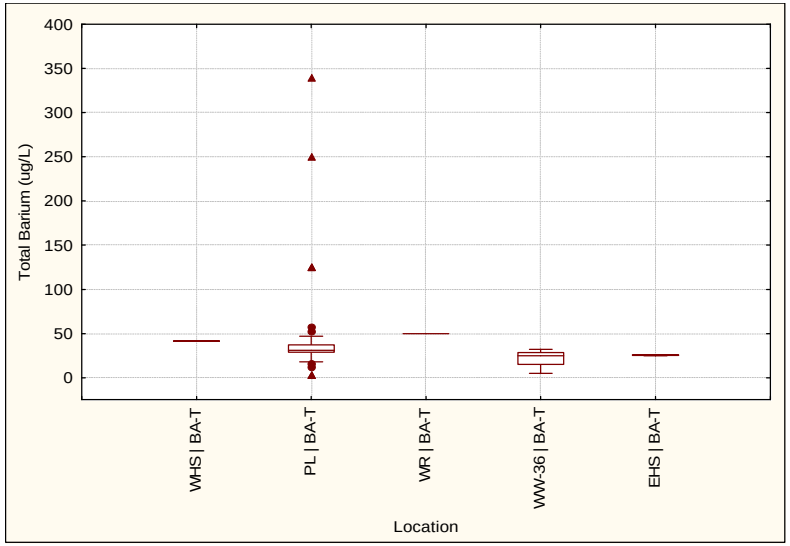

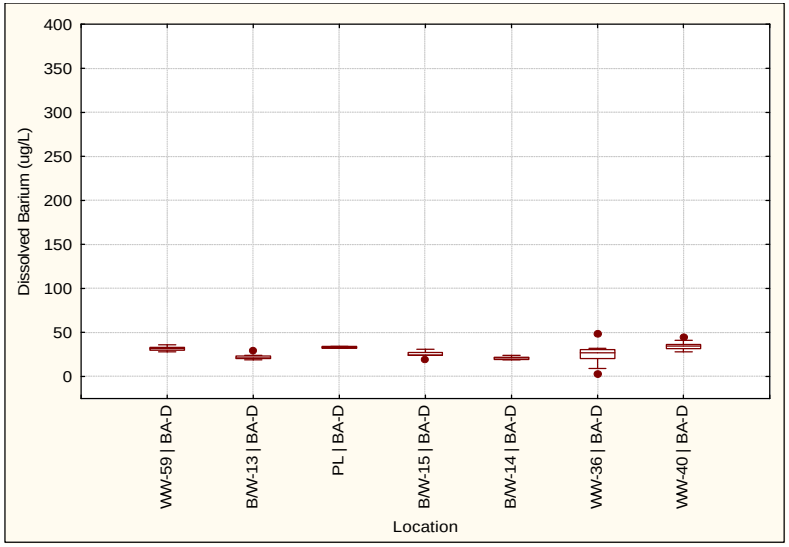

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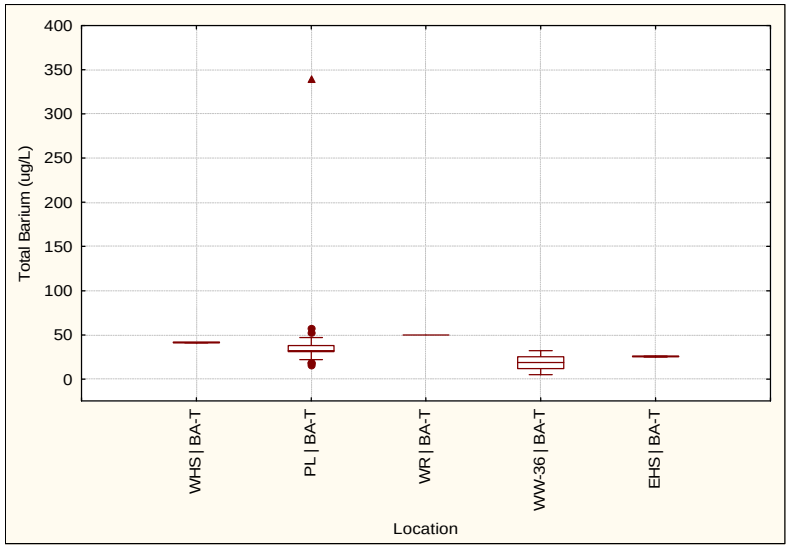

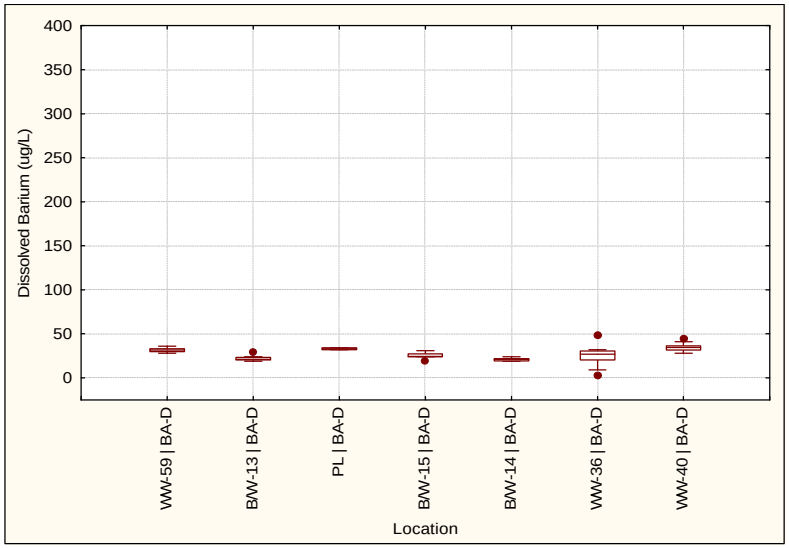

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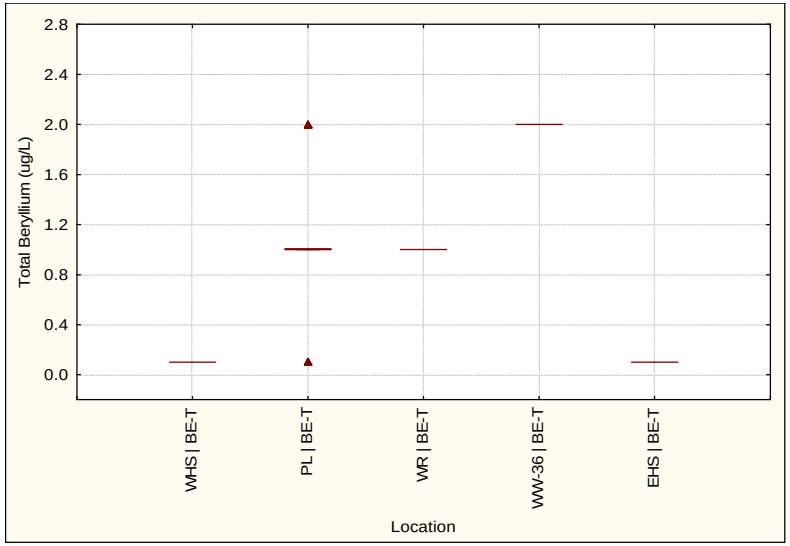

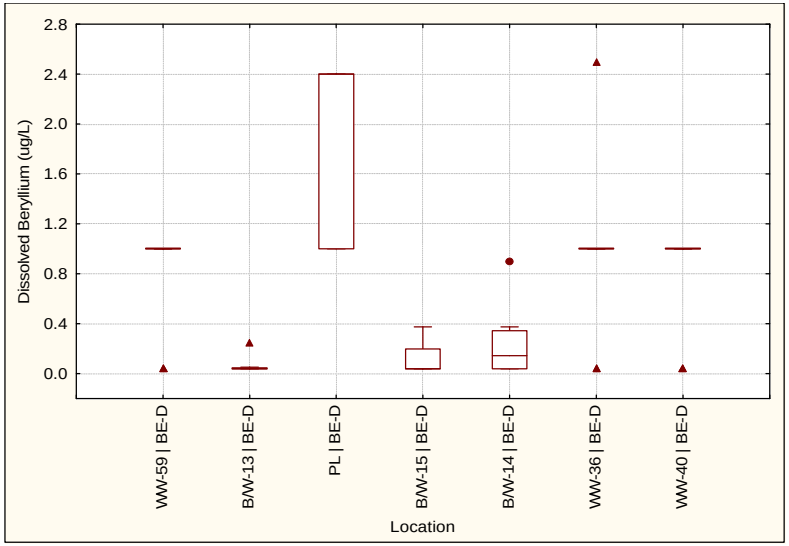

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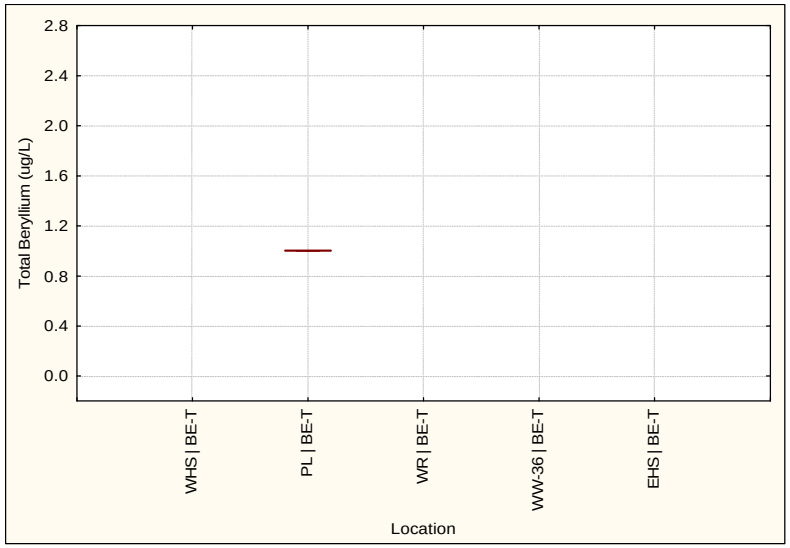

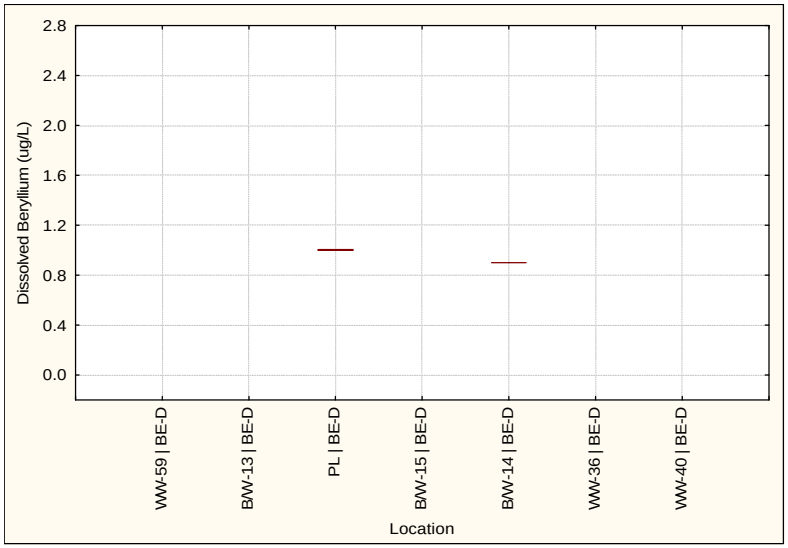

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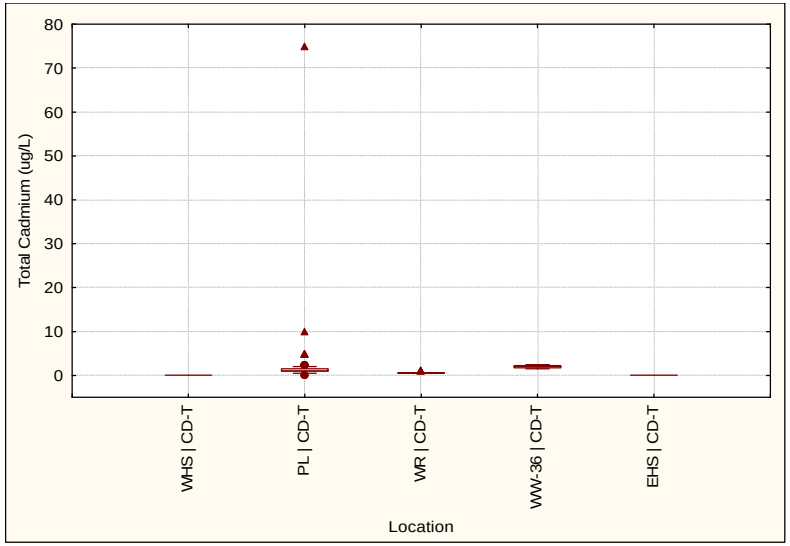

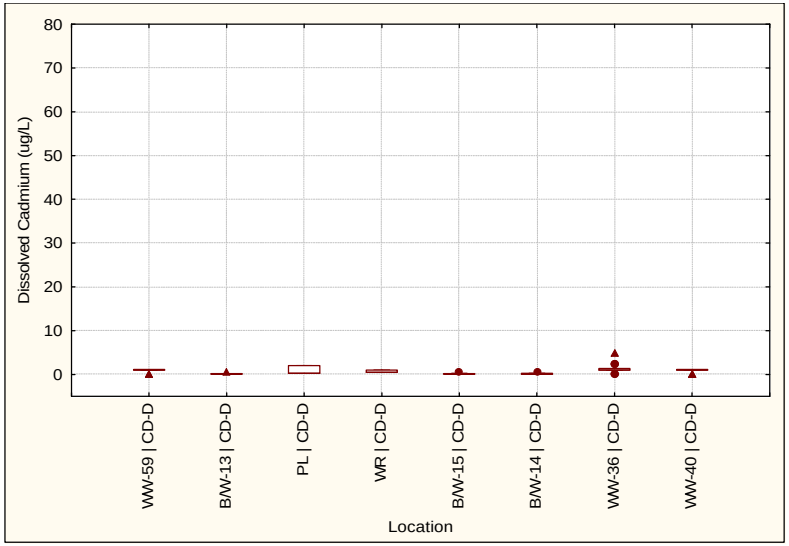

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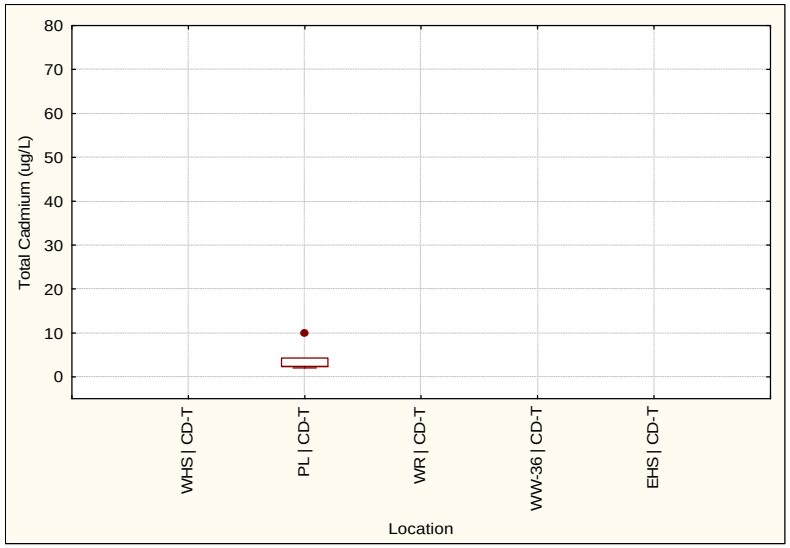

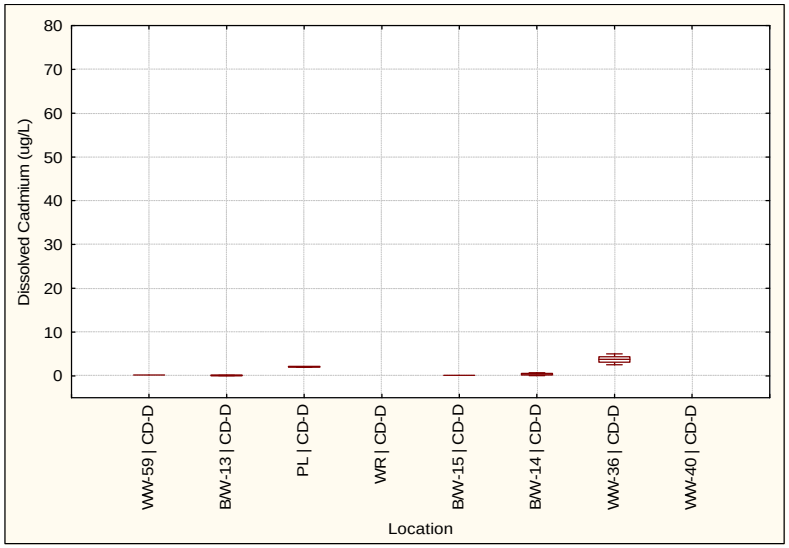

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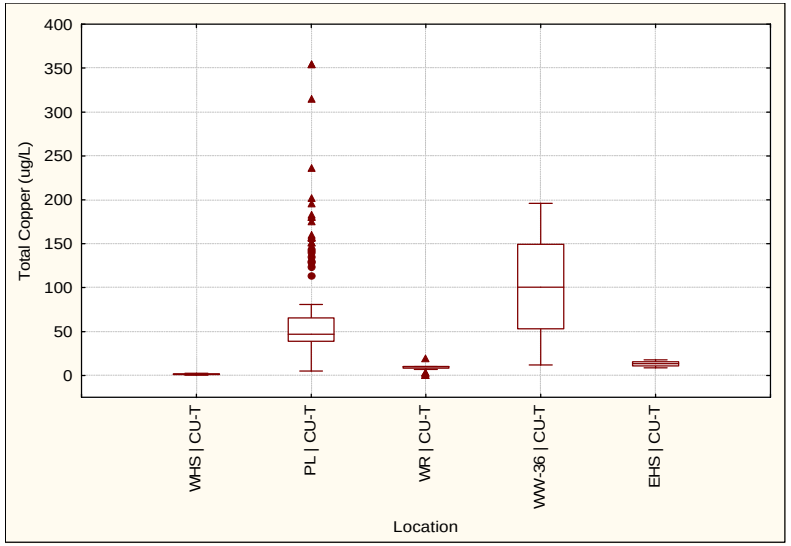

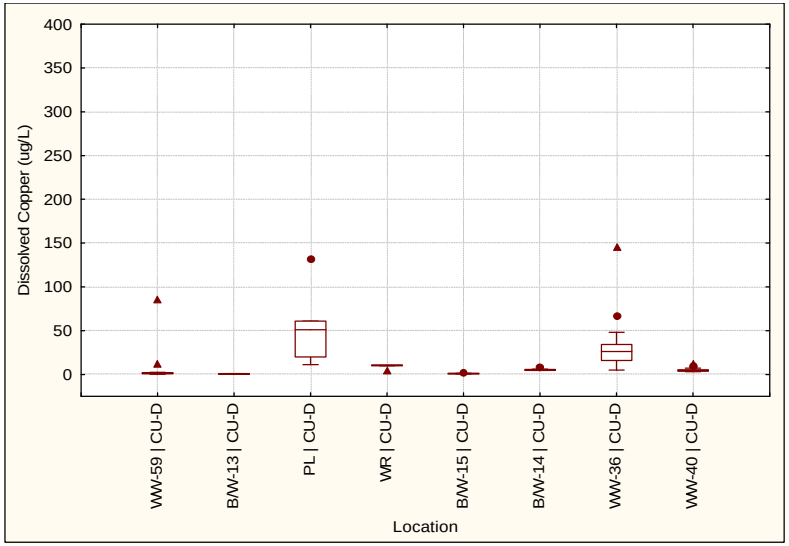

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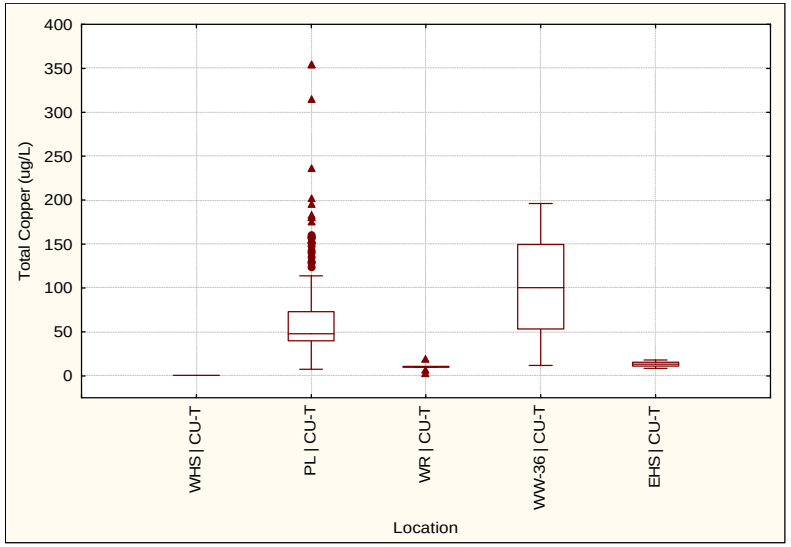

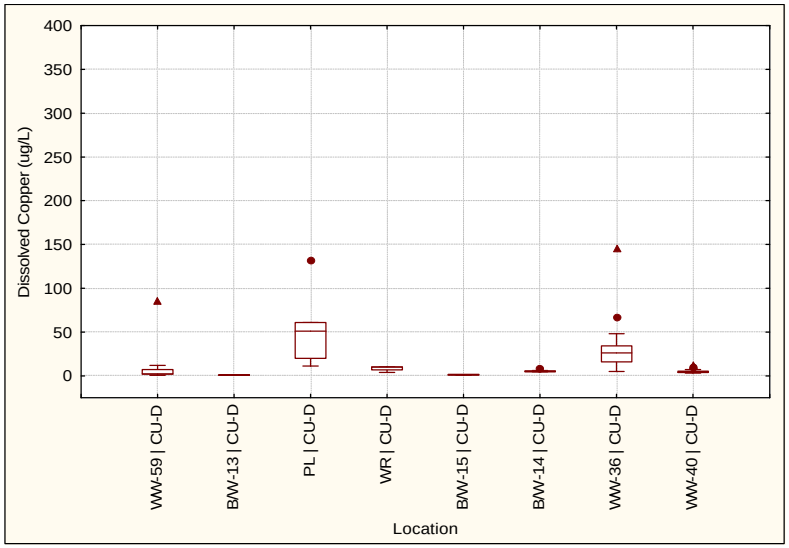

Figure 2. Boxplots of Metals

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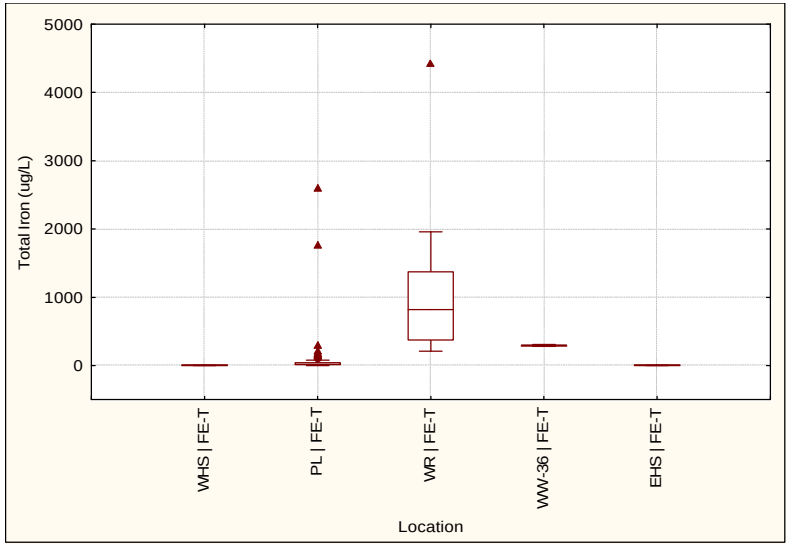

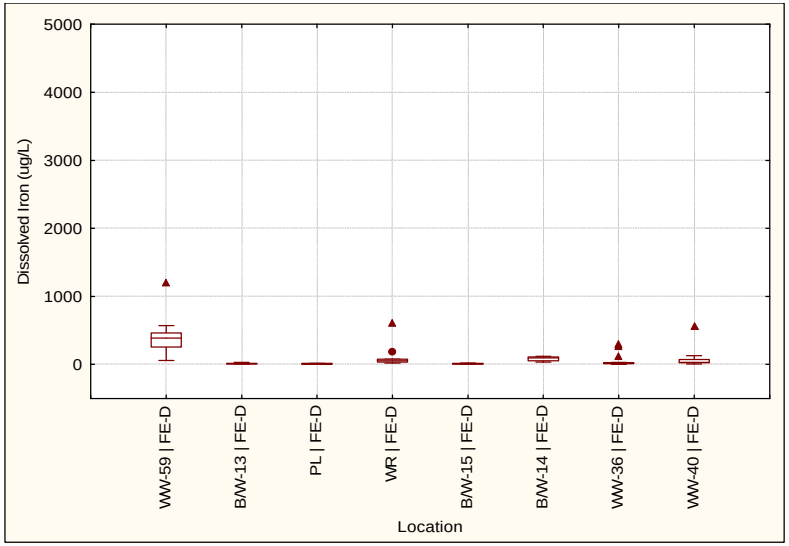

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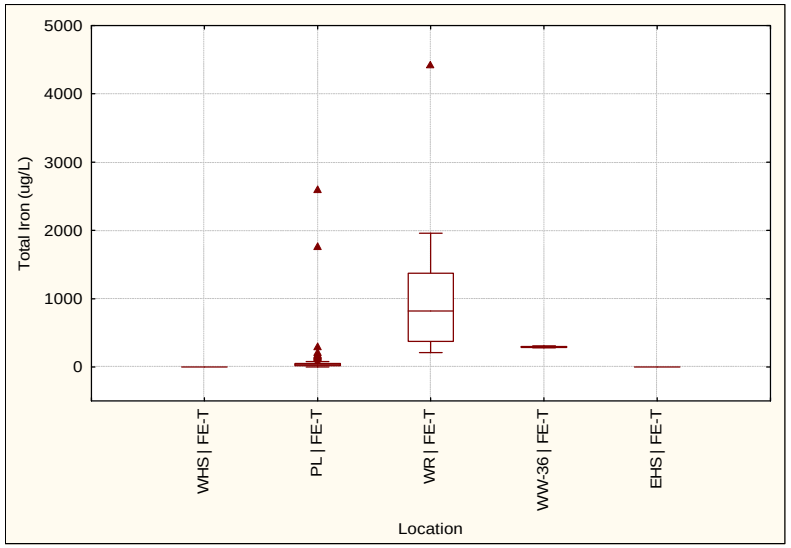

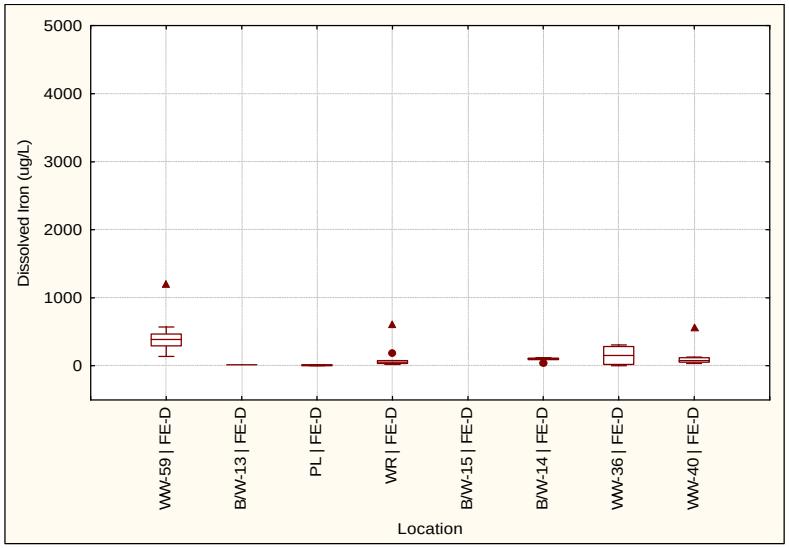

Figure 2. Boxplots of Metals

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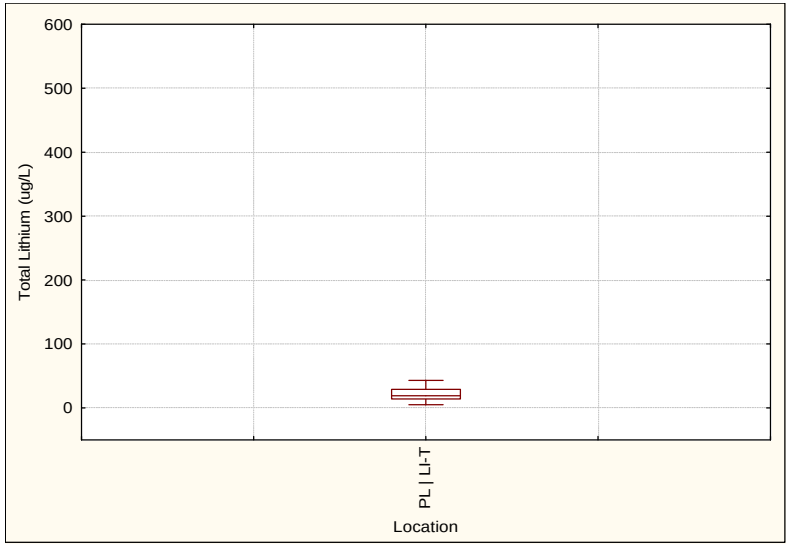

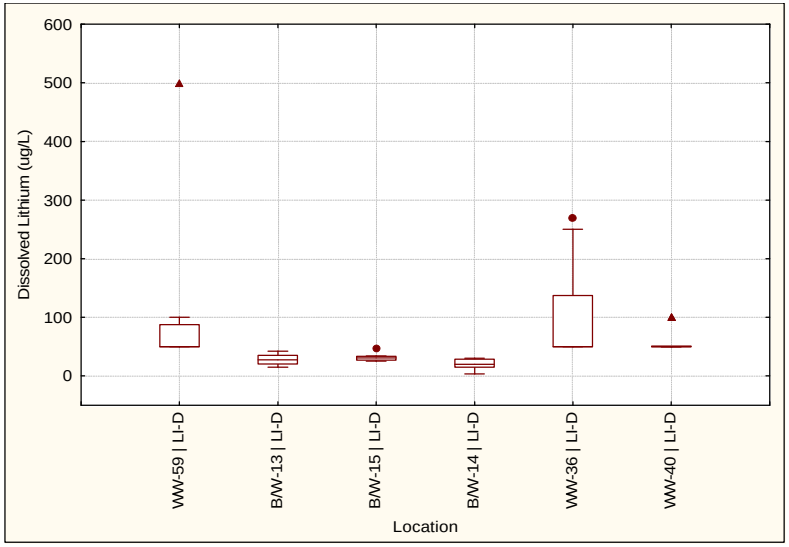

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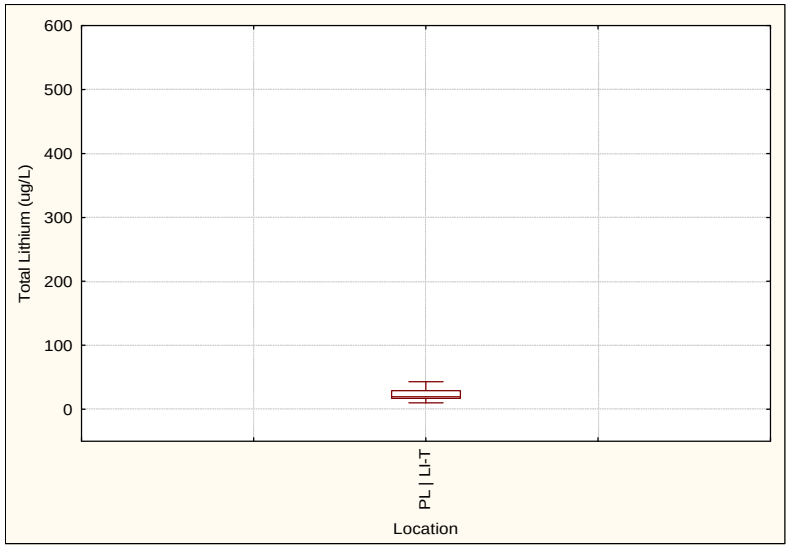

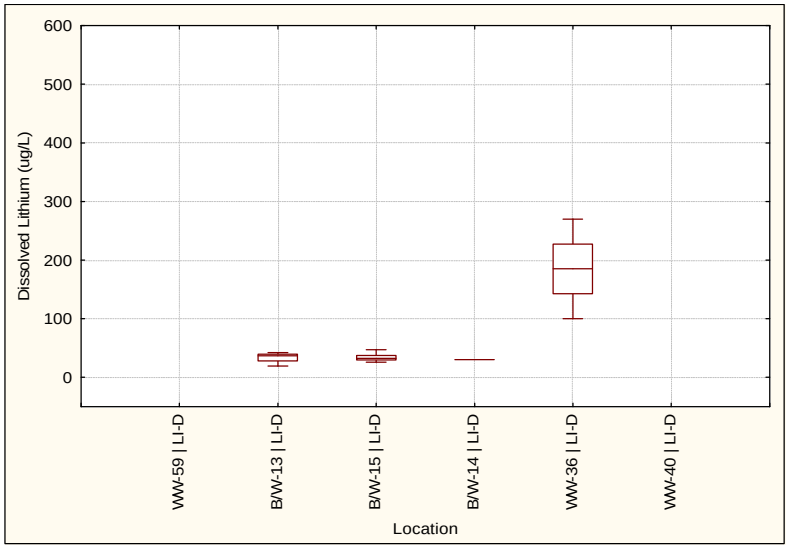

Figure 2. Boxplots of Metals

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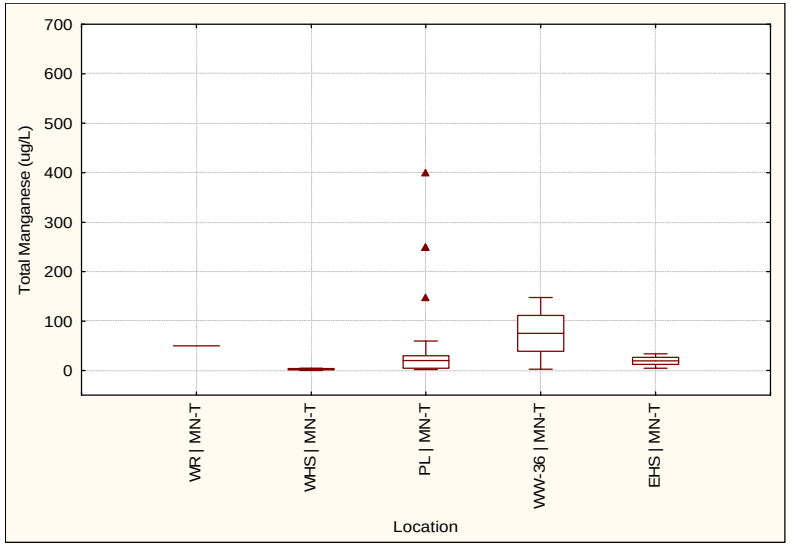

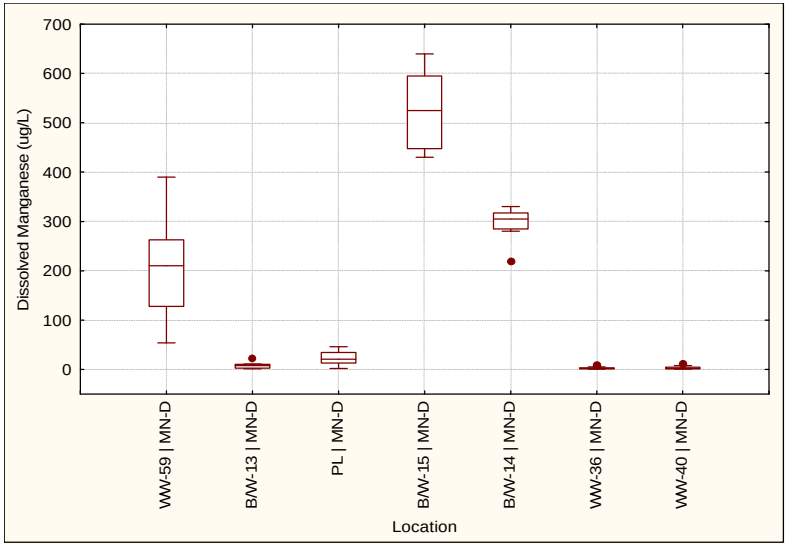

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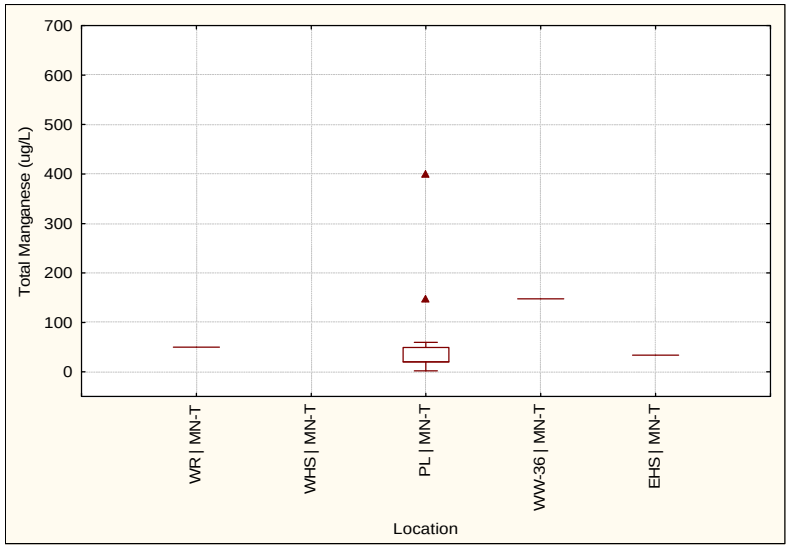

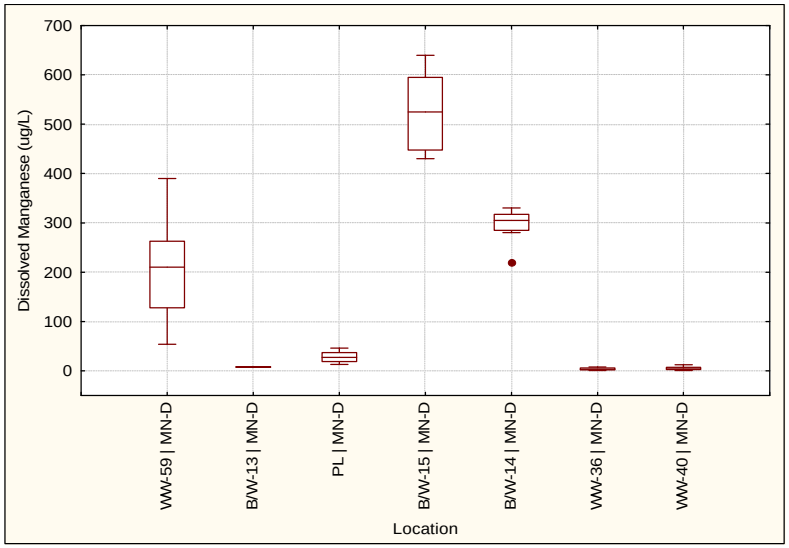

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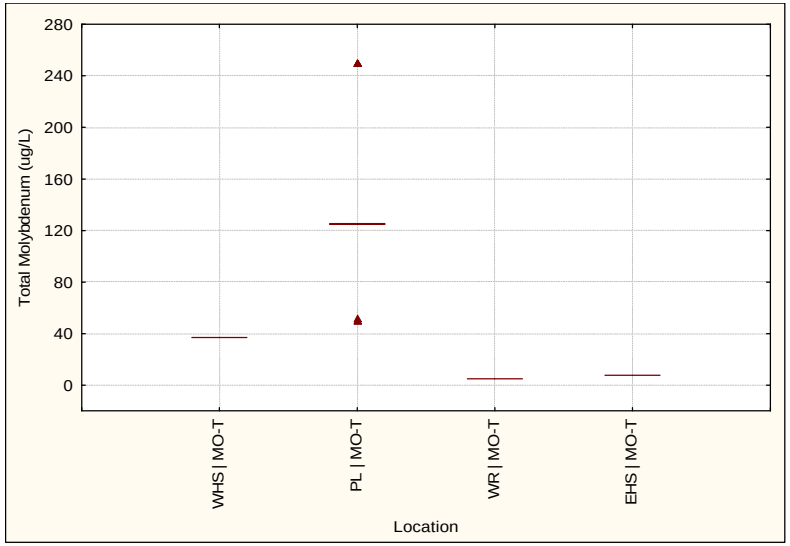

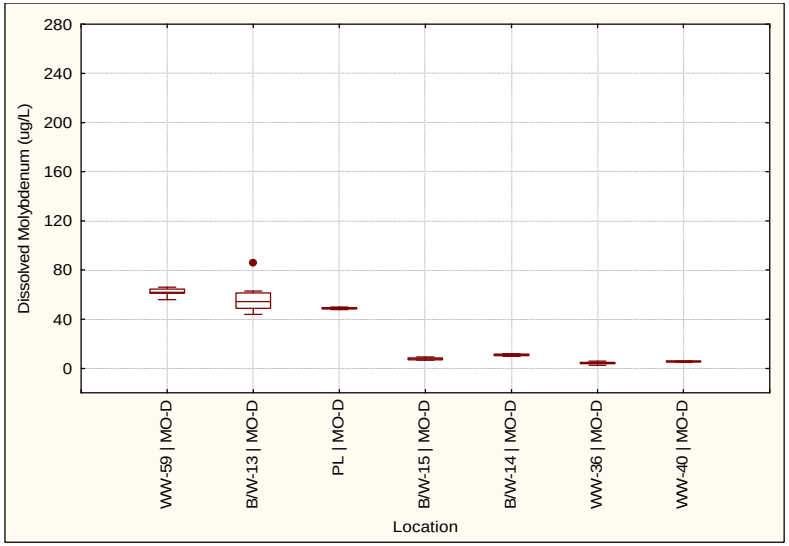

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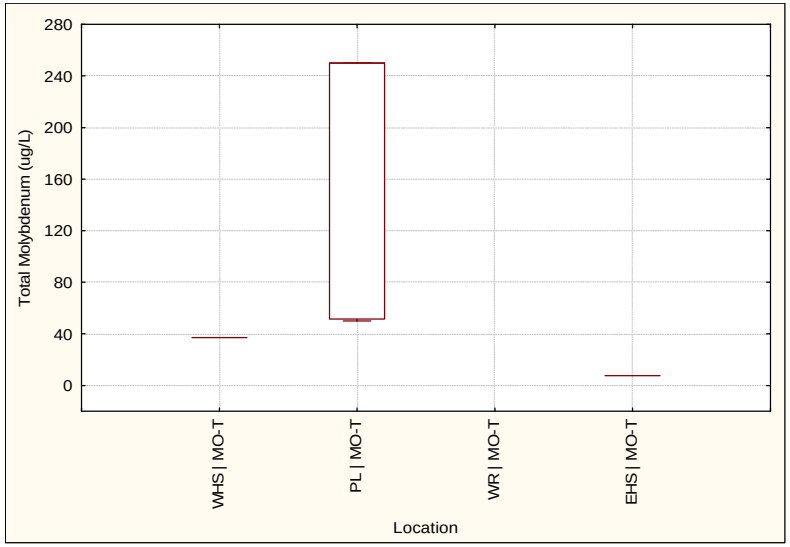


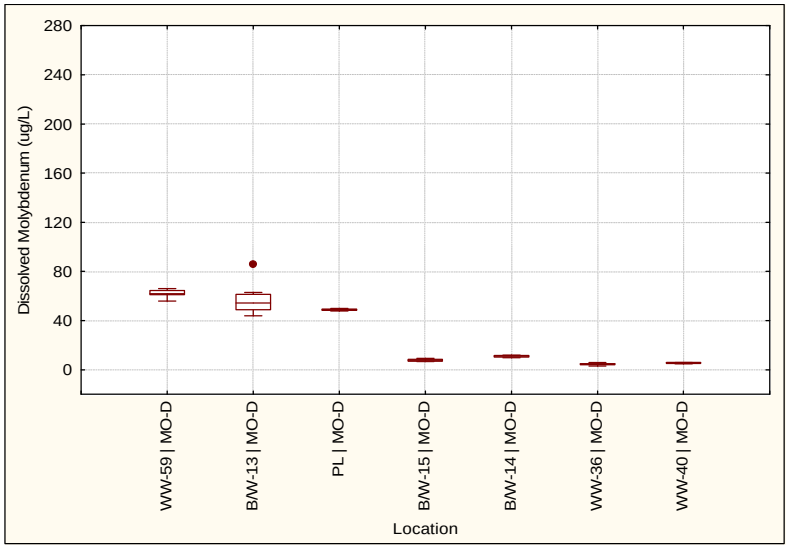
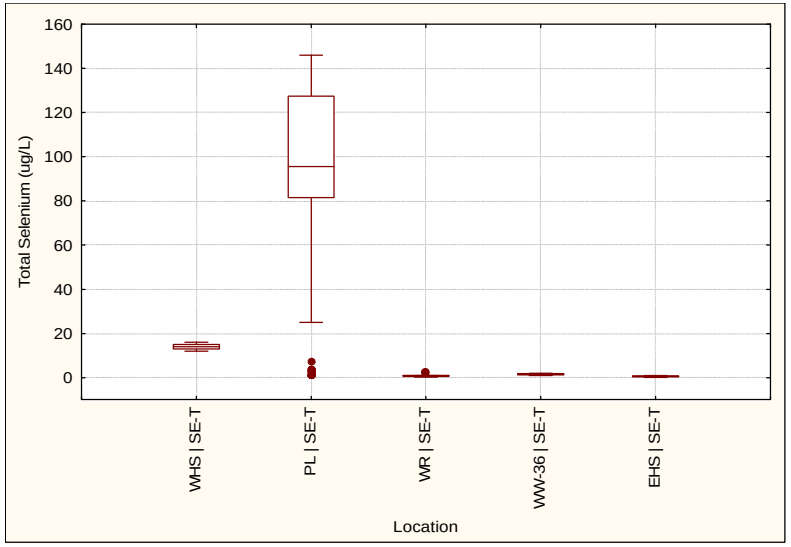
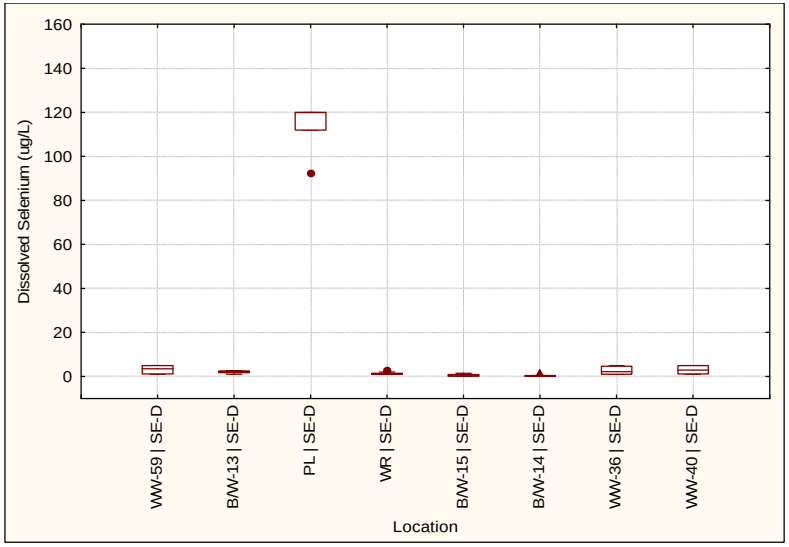


Figure 2. Boxplots of Metals

Nondetects Included at 1/2 Reporting Limit





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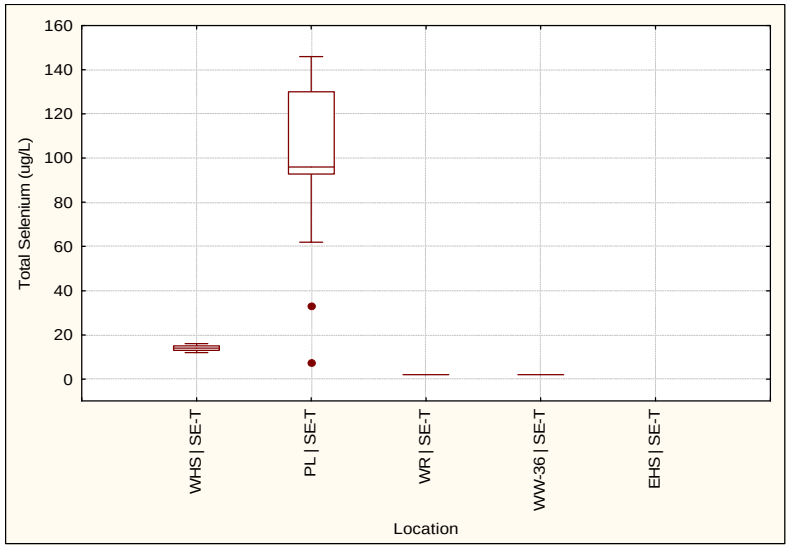


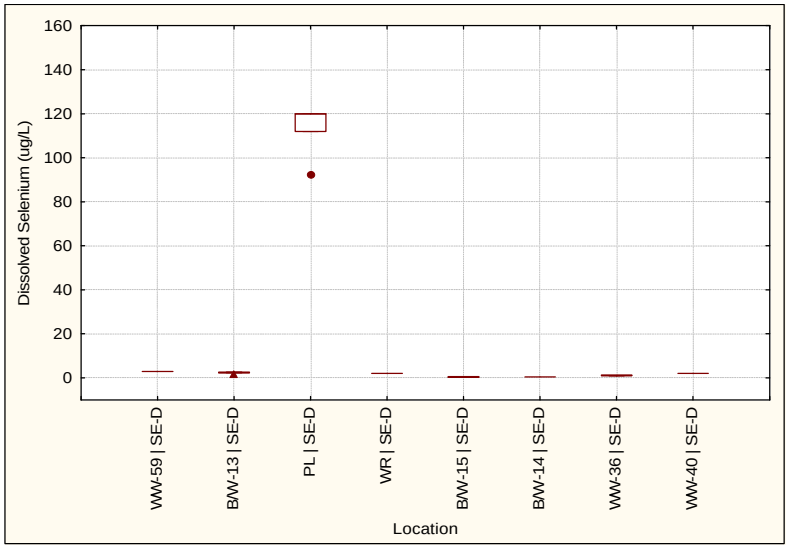
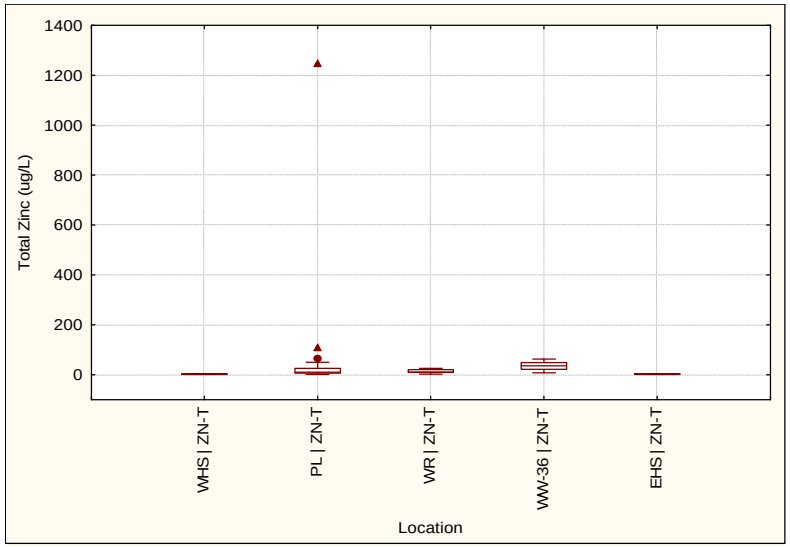
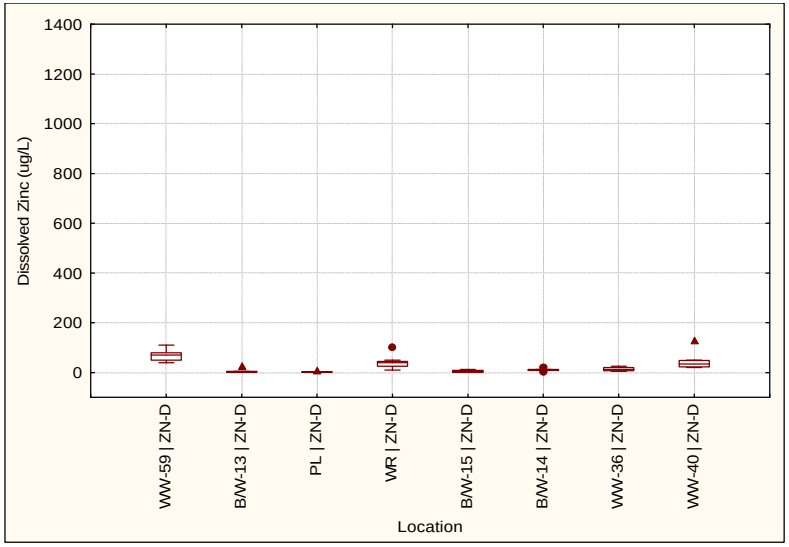


Figure 2. Boxplots of Metals

Nondetects Included at 1/2 Reporting Limit





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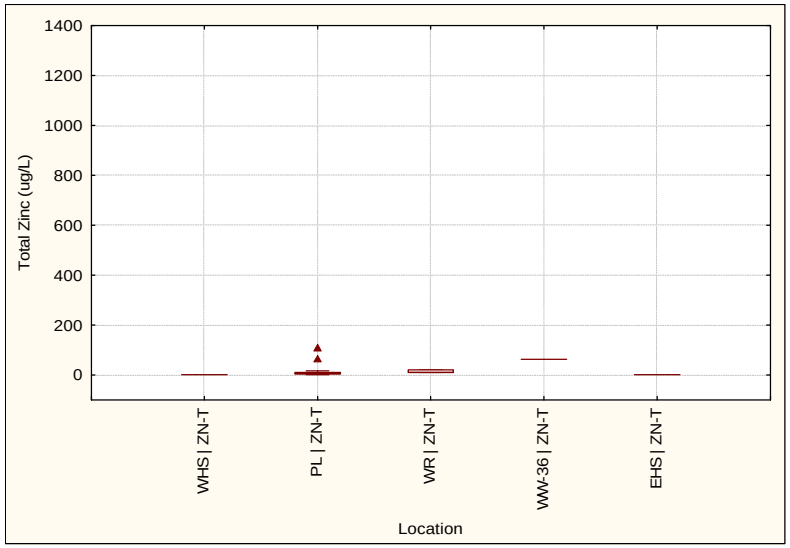


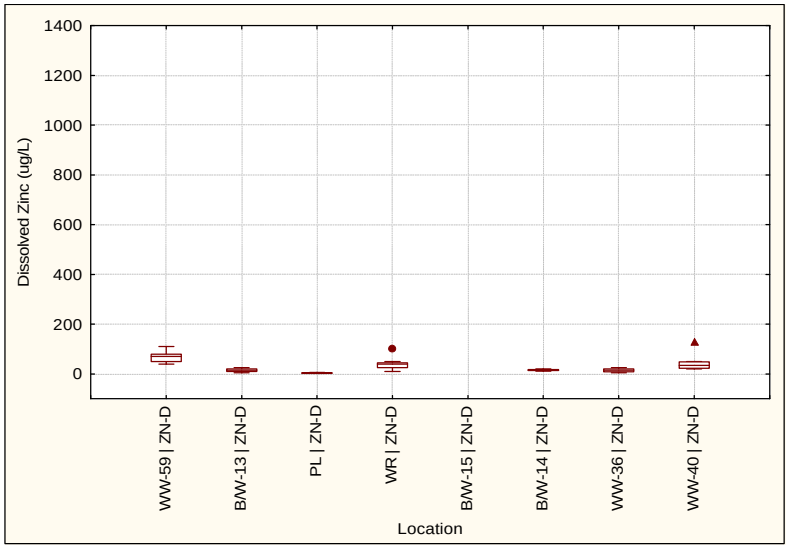
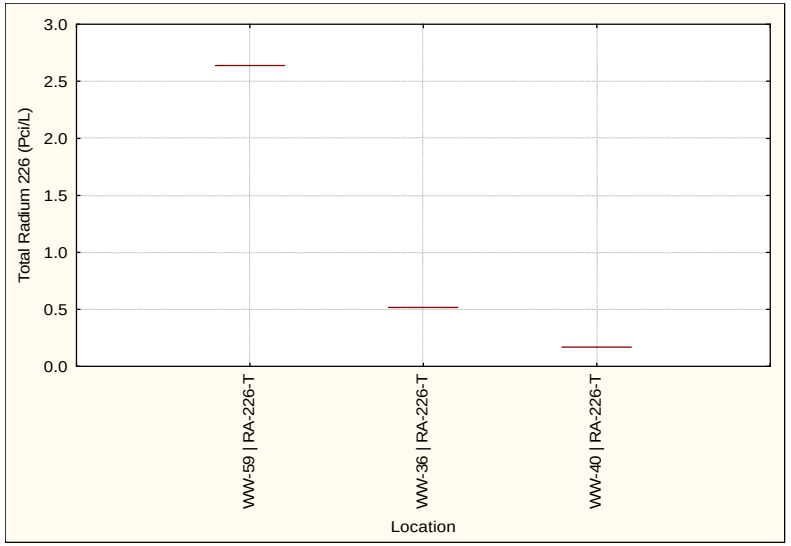
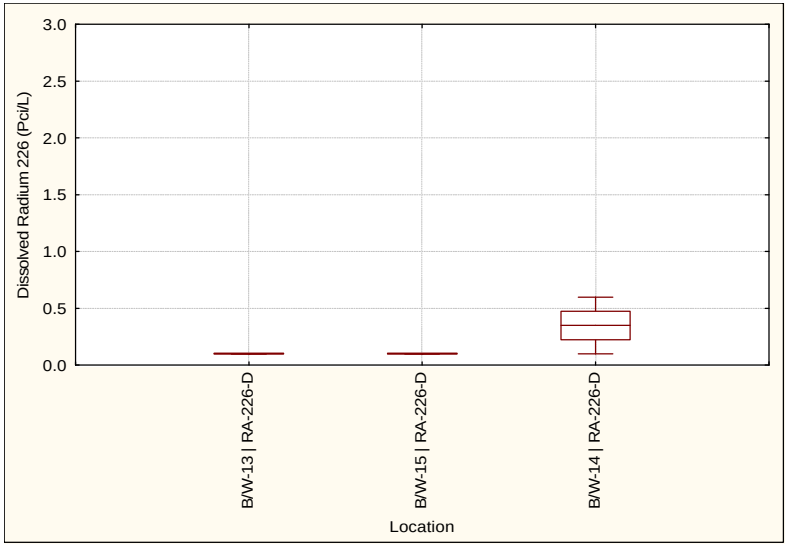


Figure 3. Boxplots of Radiochemicals

Nondetects Included at 1/2 Reporting Limit





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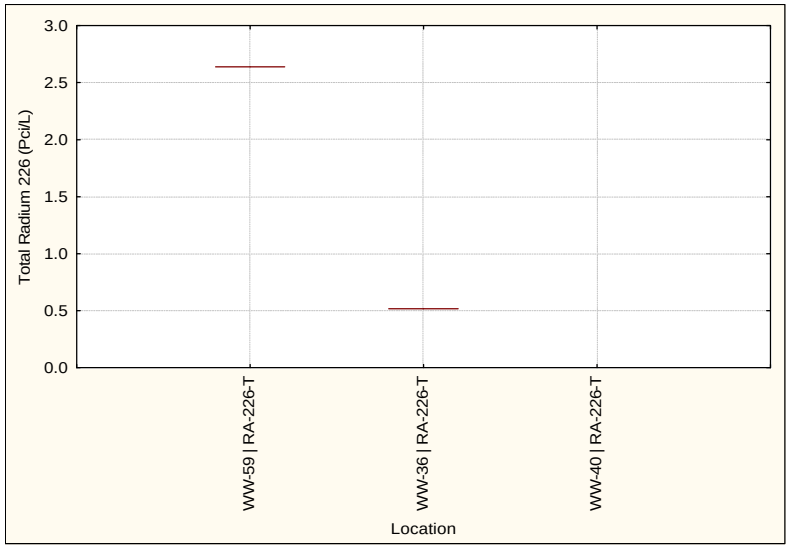


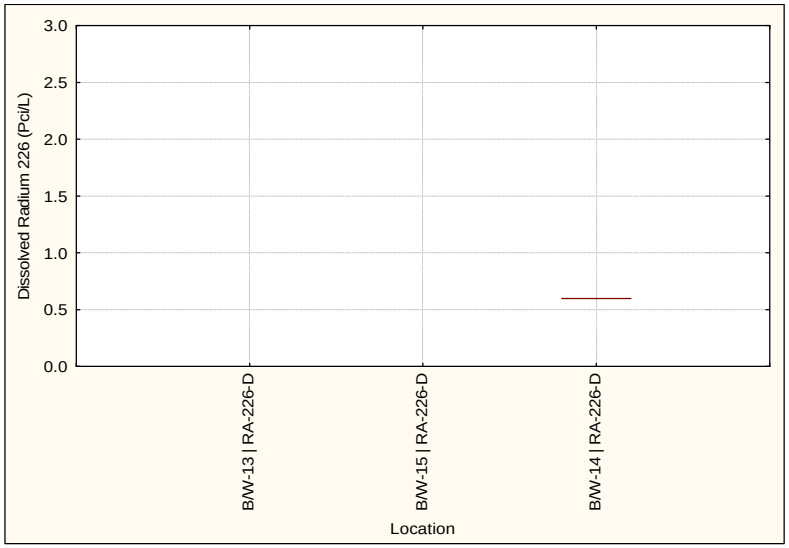
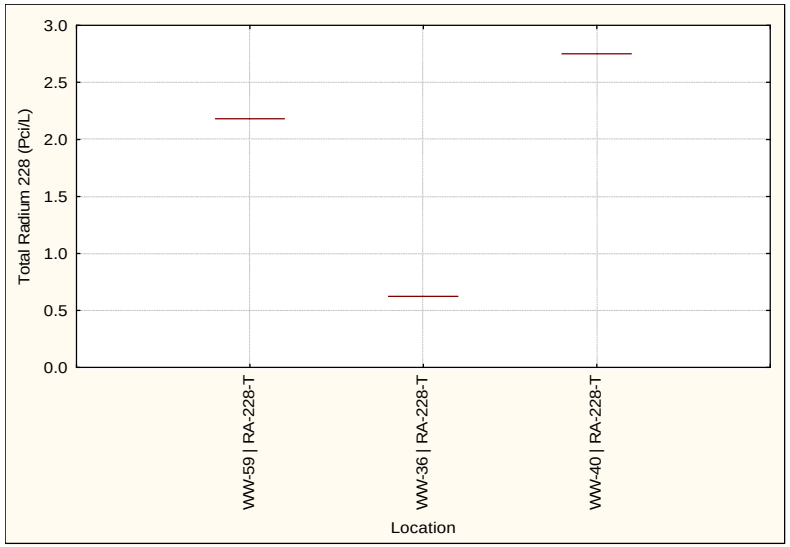
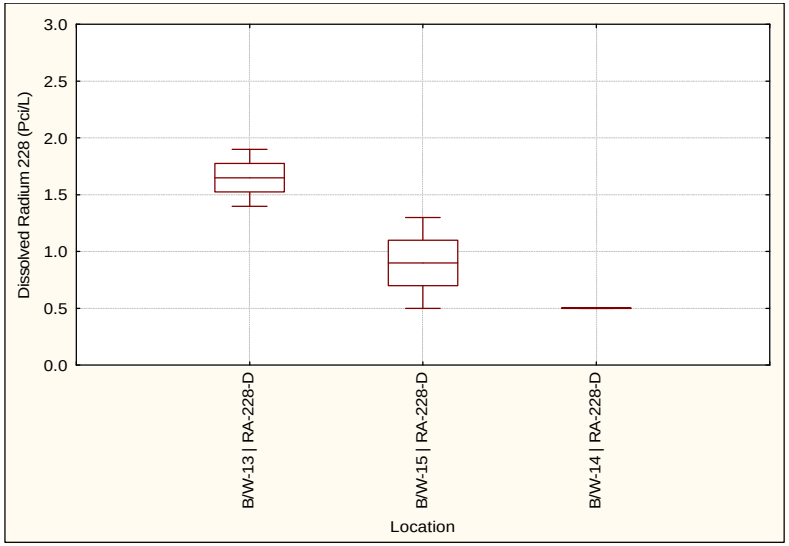


Figure 3. Boxplots of Radiochemicals

Nondetects Included at 1/2 Reporting Limit





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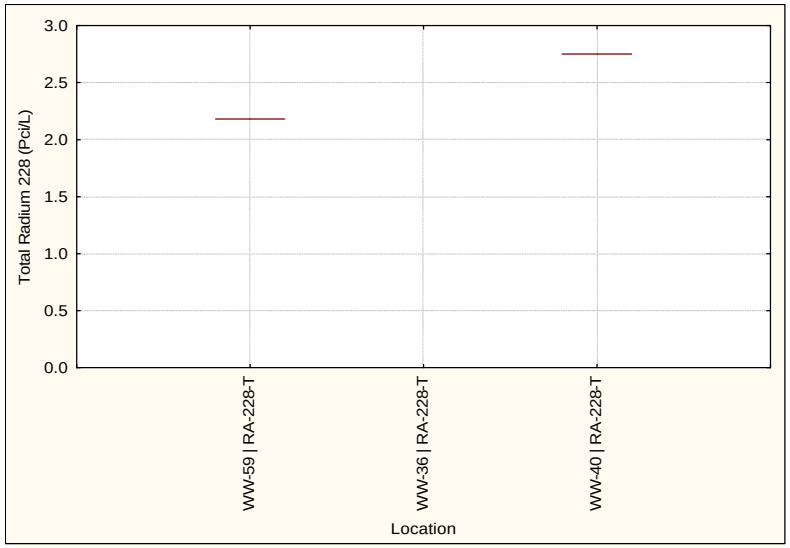

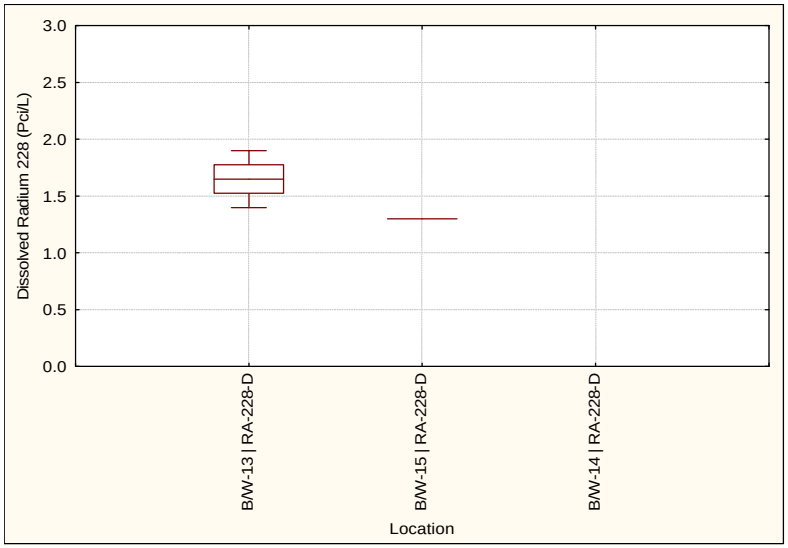

Figure 3. Boxplots of Radiochemicals

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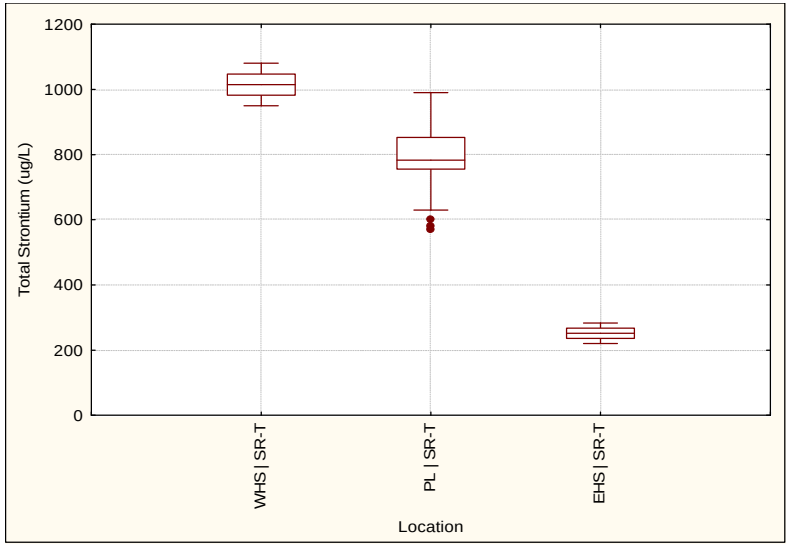

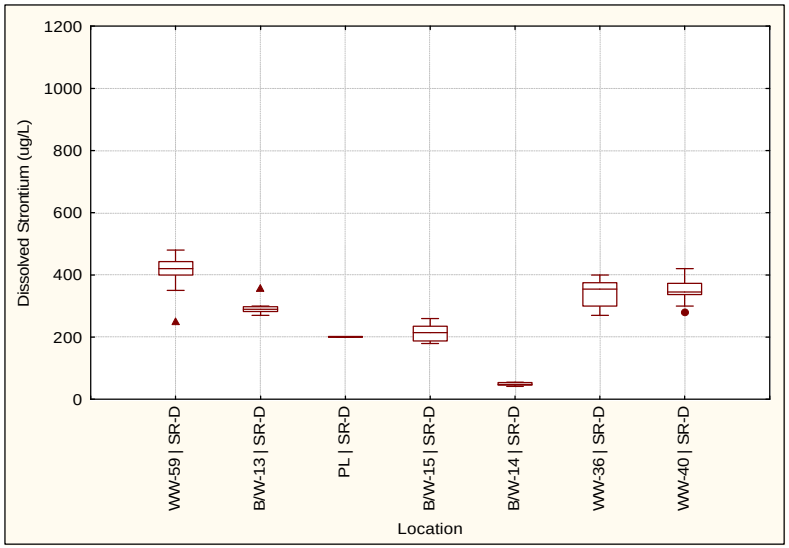

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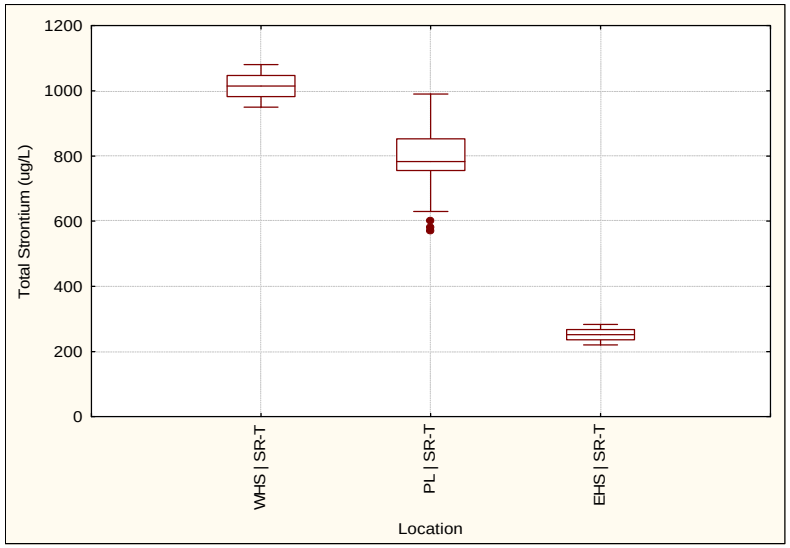

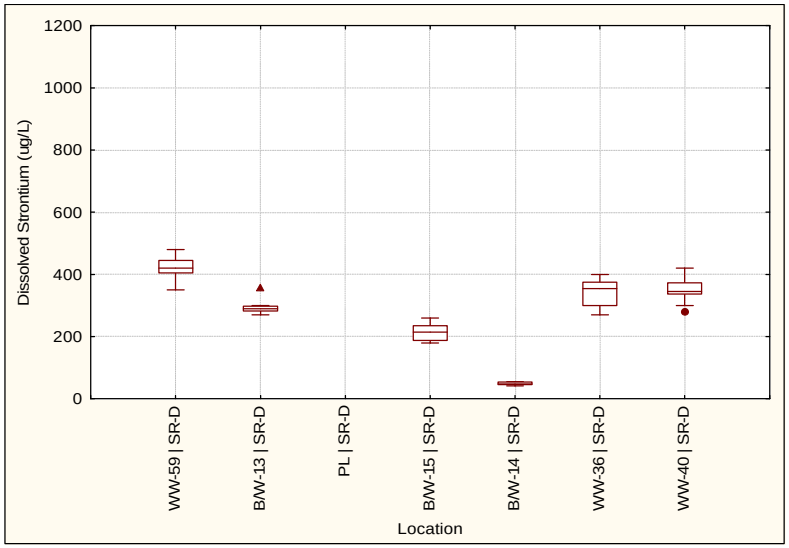

Figure 3. Boxplots of Radiochemicals

Nondetects Included at 1/2 Reporting Limit

No Total Results

No Dissolved Results

Nondetects Not Included

No Total Results

No Dissolved Results

Figure 3. Boxplots of Radiochemicals

Nondetects Included at 1/2 Reporting Limit

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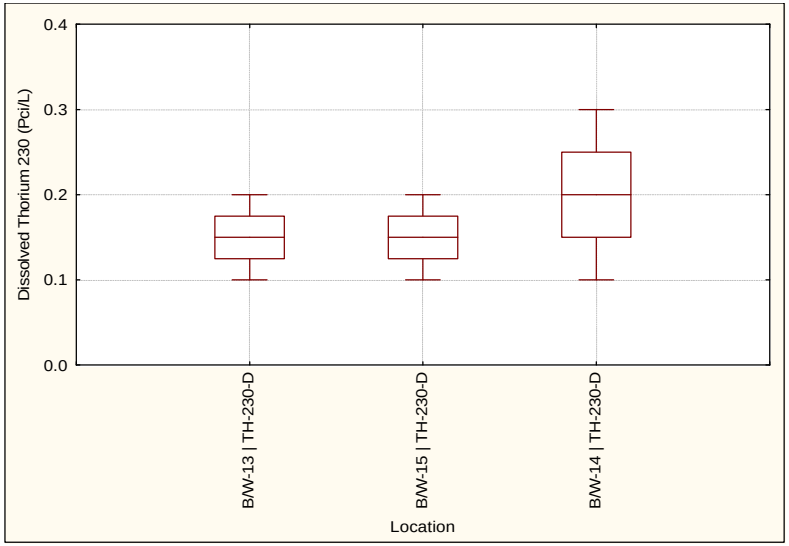

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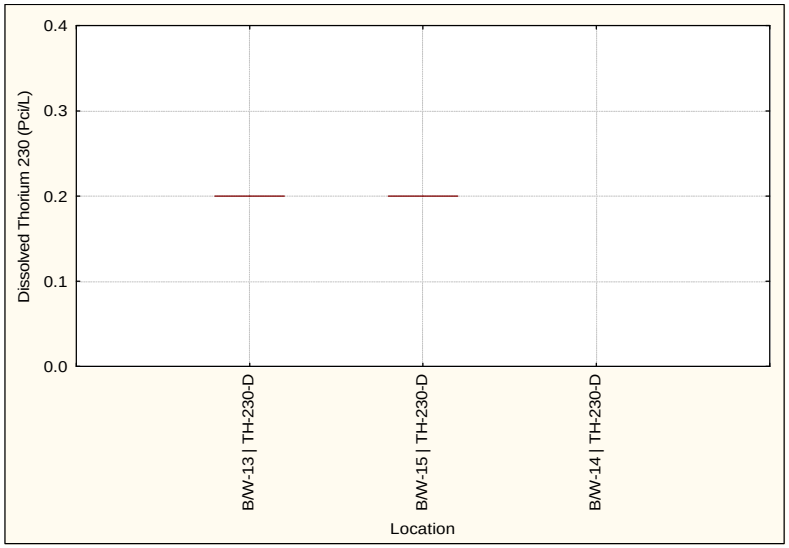

Figure 3. Boxplots of Radiochemicals

Nondetects Included at 1/2 Reporting Limit

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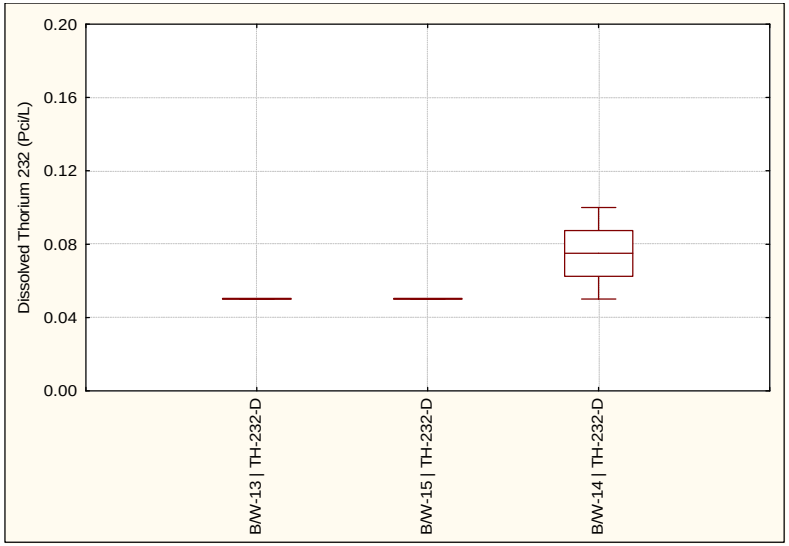

Nondetects Not Included

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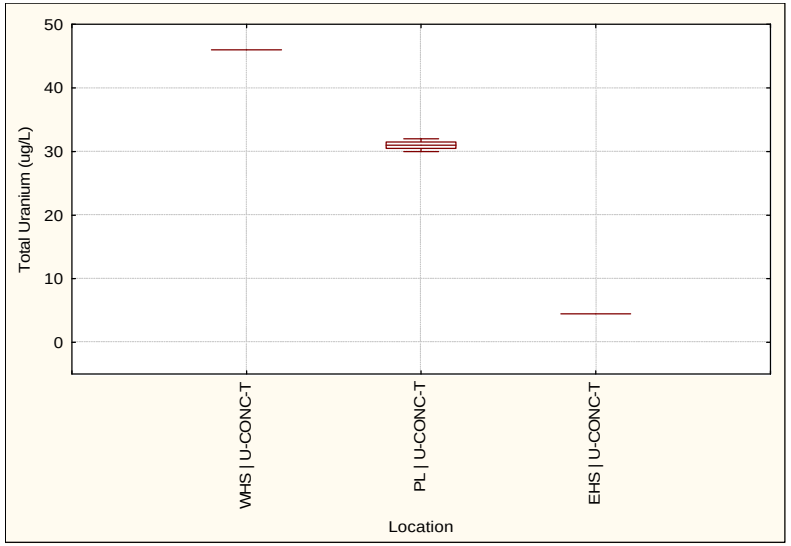
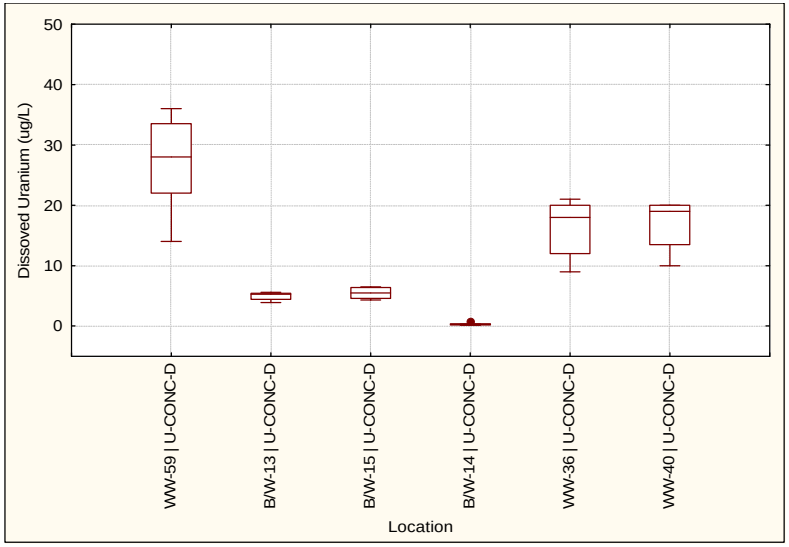
No Dissolved Results

Figure 3. Boxplots of Radiochemicals

Nondetects Included at 1/2 Reporting Limit





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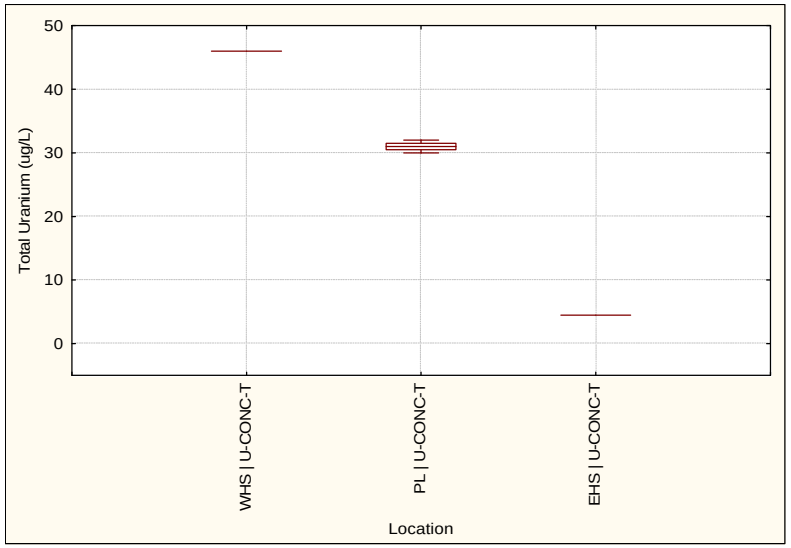


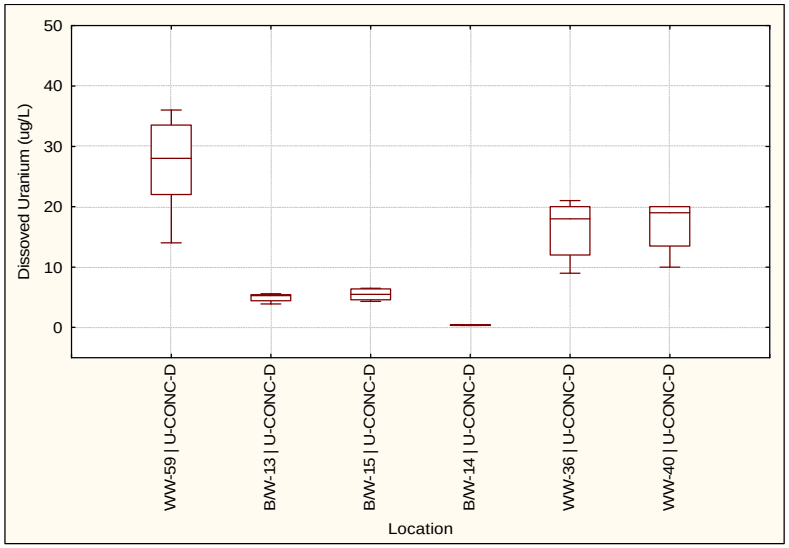
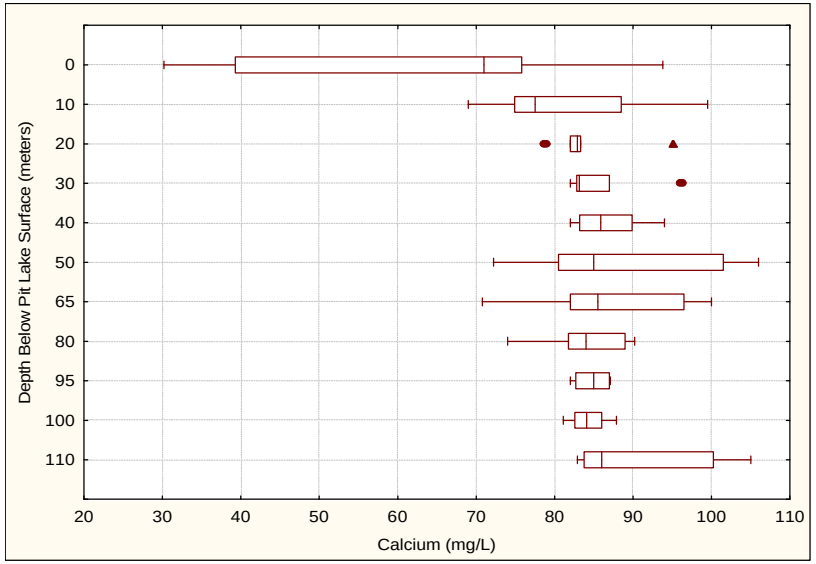
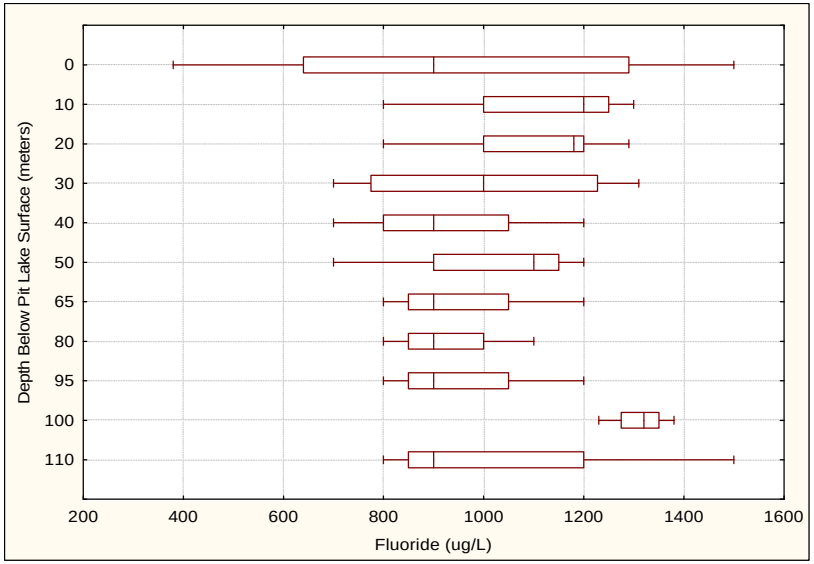
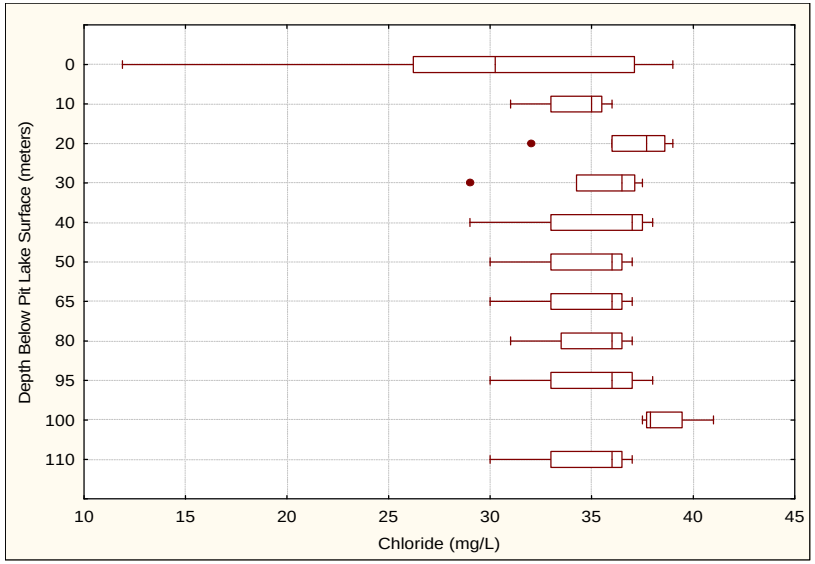


Figure 4. Boxplots of Water Quality Parameters, Major Ions, and Radiochemicals in Pit Water - May 1998 to August 2001







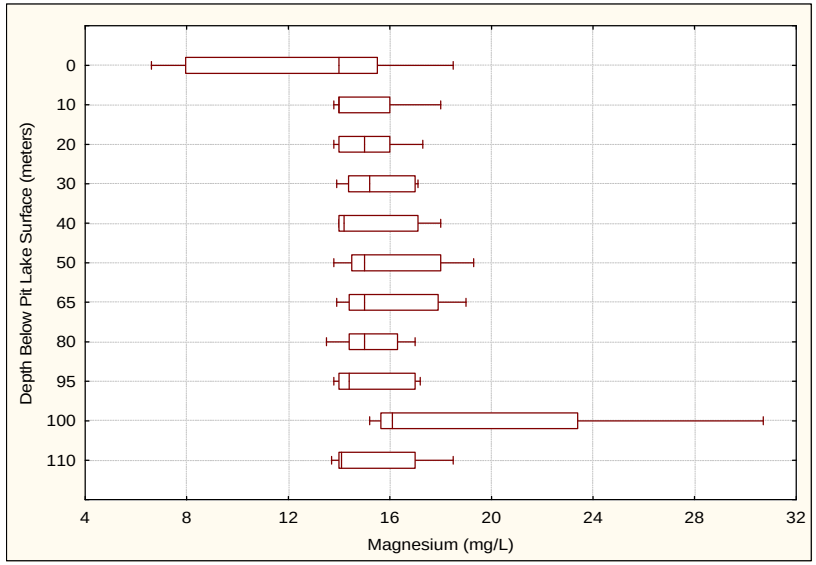


Figure 4. Boxplots of Water Quality Parameters, Major Ions, and Radiochemicals in Pit Water - May 1998 to August 2001

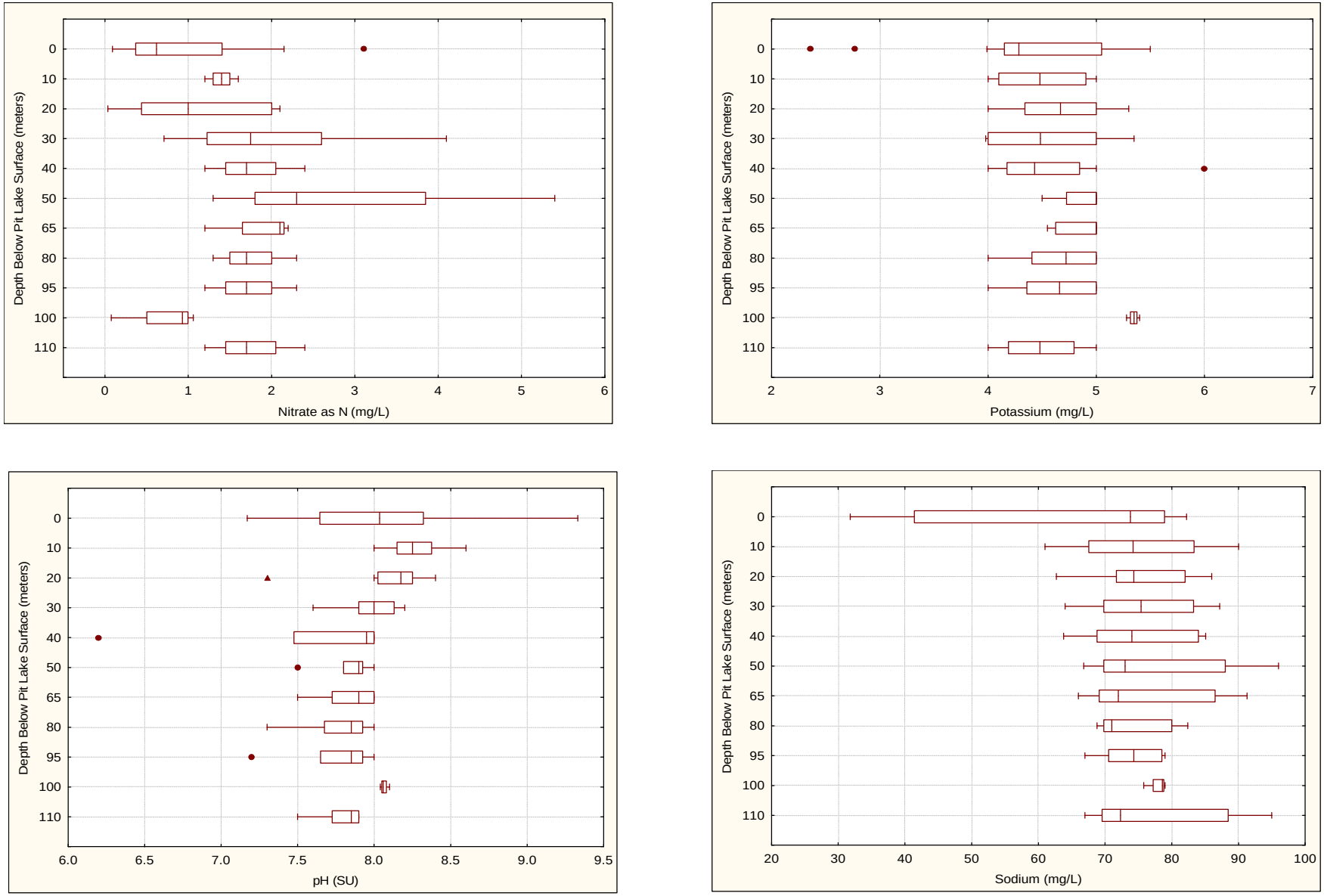
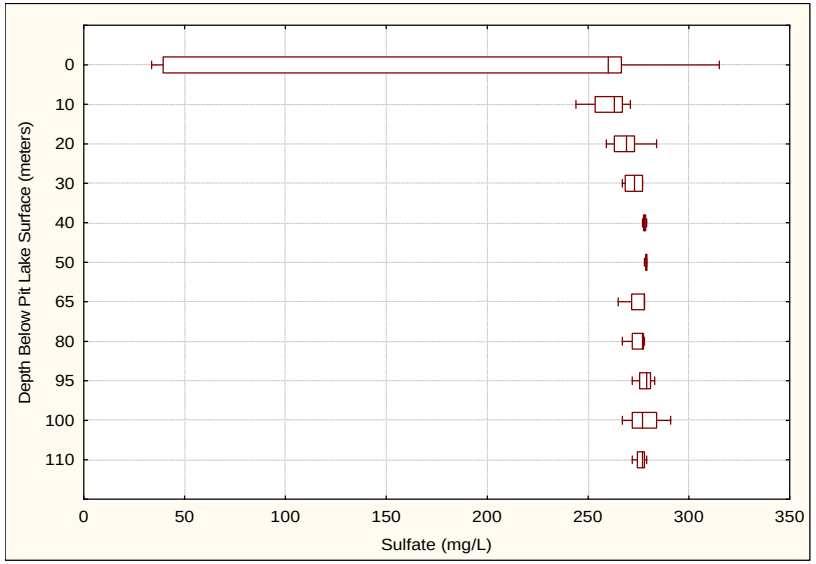
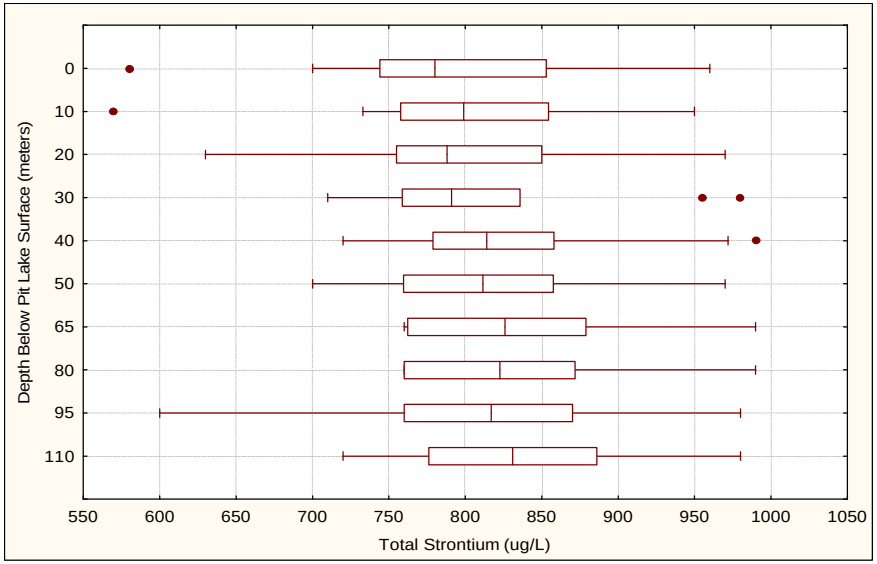


Figure 4. Boxplots of Water Quality Parameters, Major Ions, and Radiochemicals in Pit Water - May 1998 to August 2001





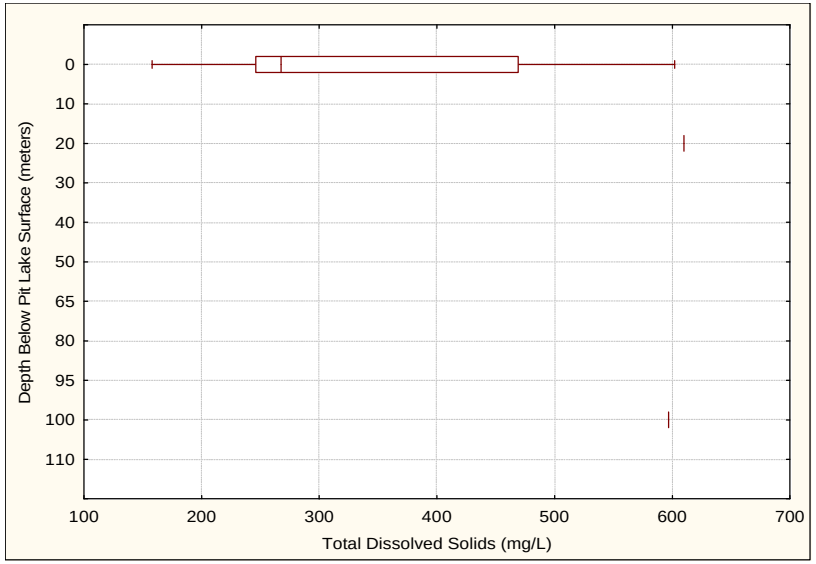
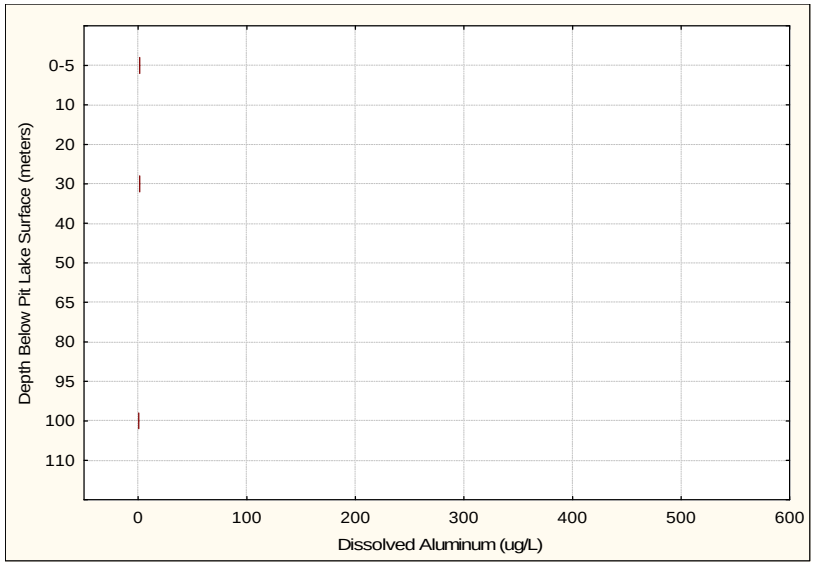
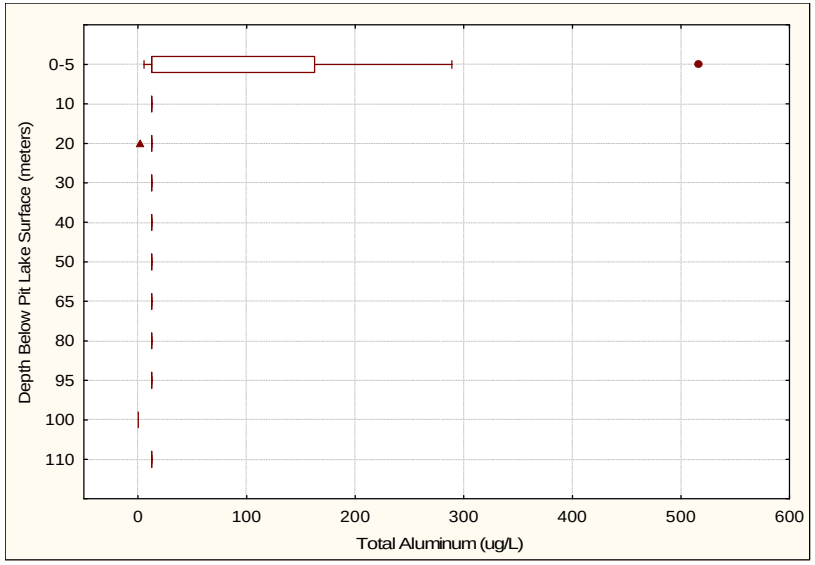


Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

Nondetects Included at 1/2 Reporting Limit:





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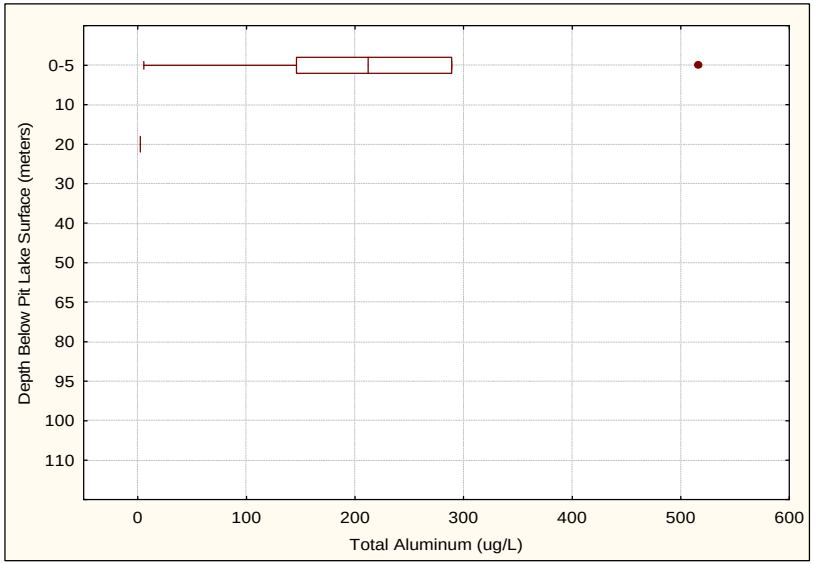

Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

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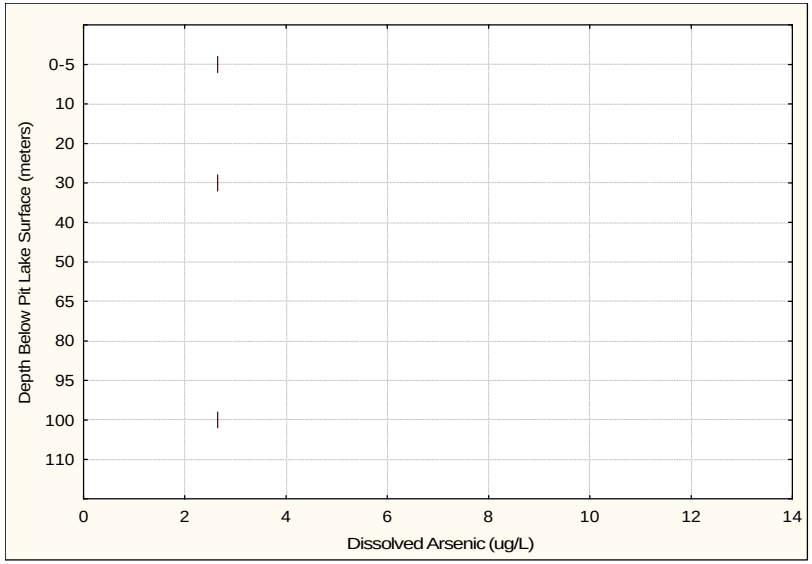

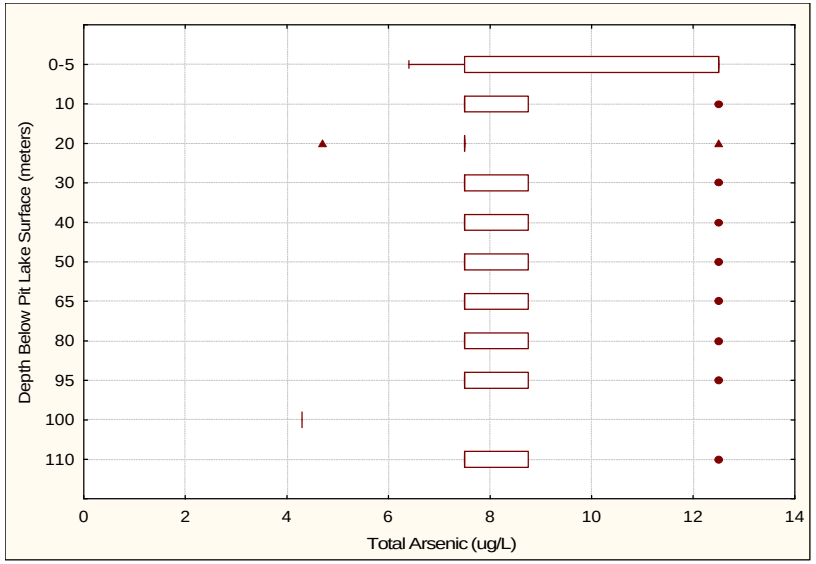

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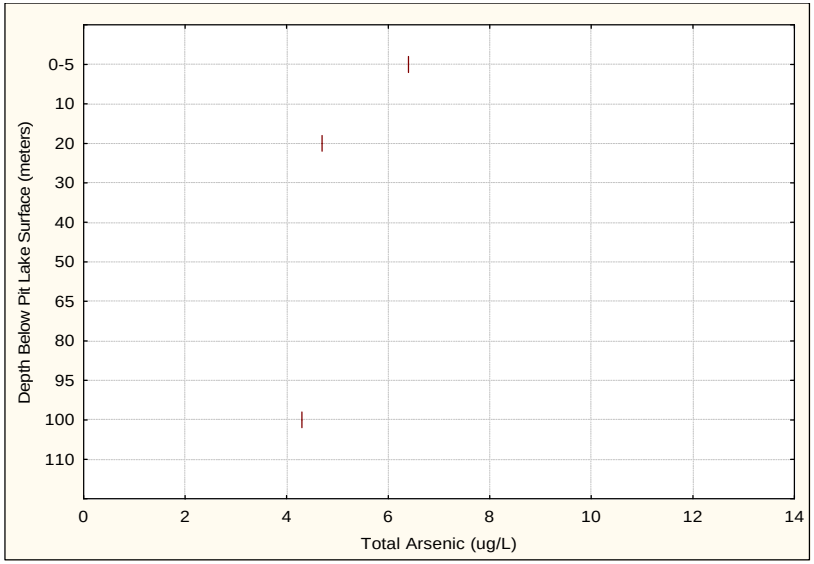

Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

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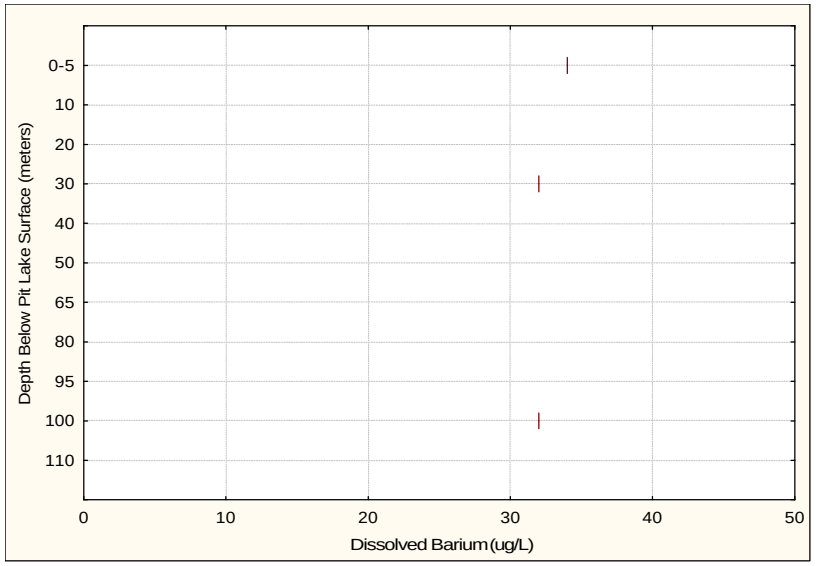

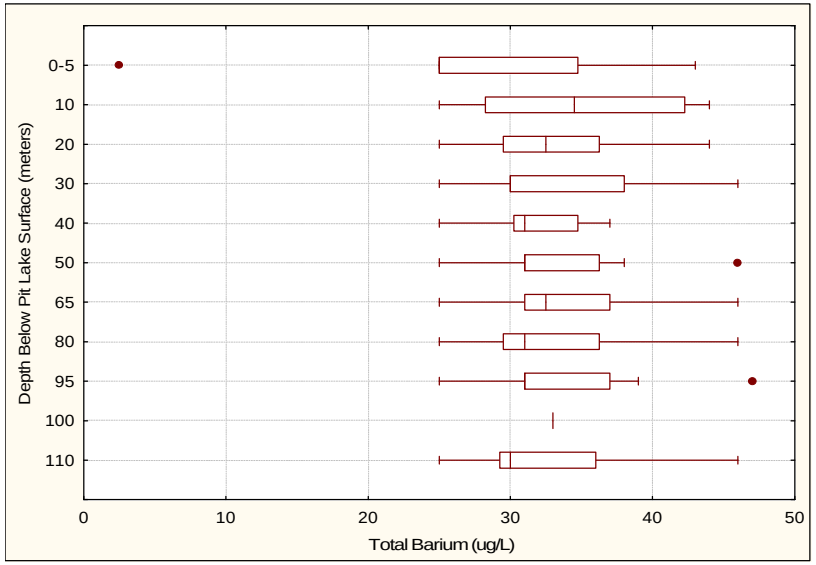

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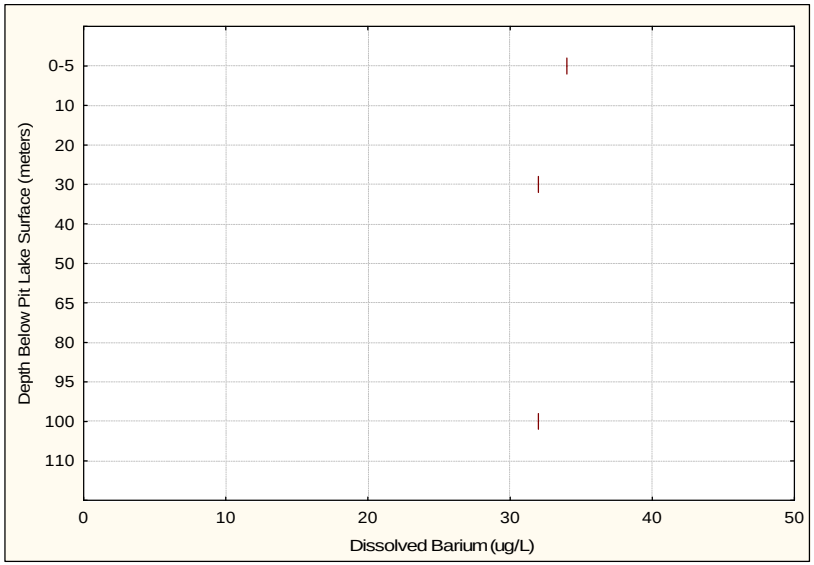

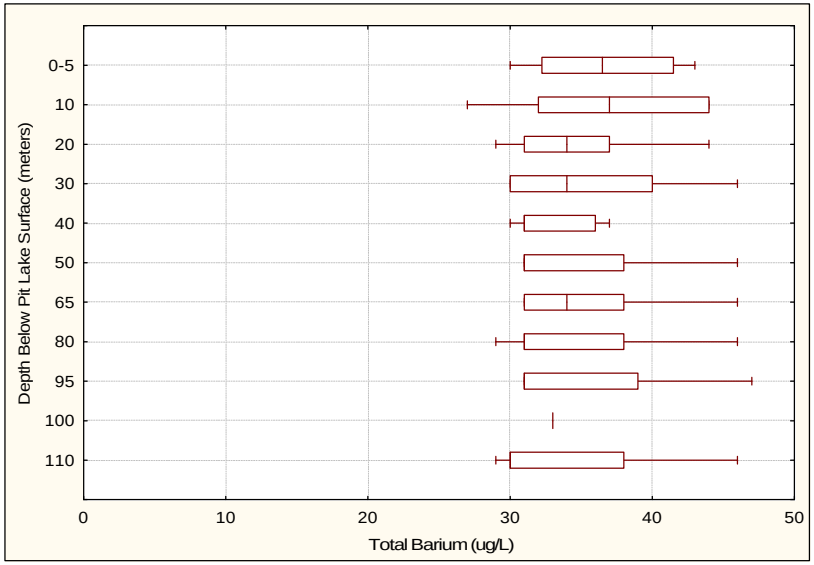

Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

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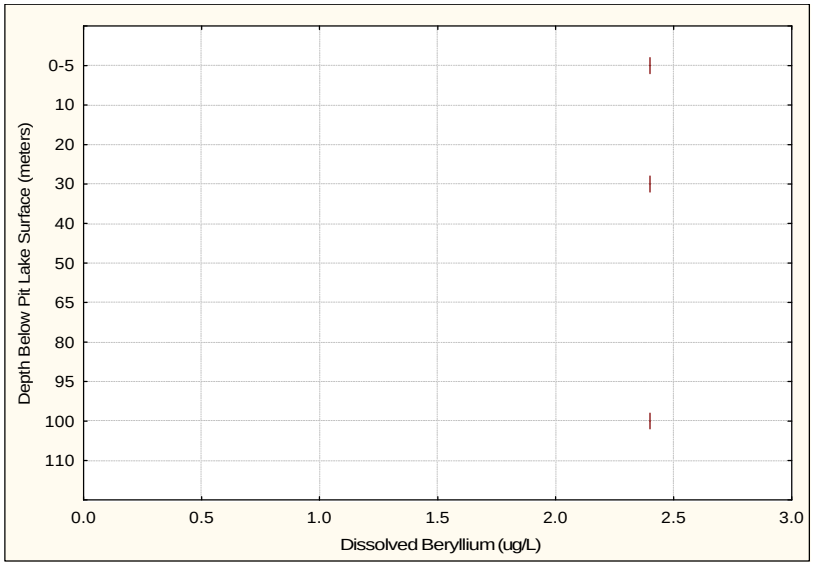

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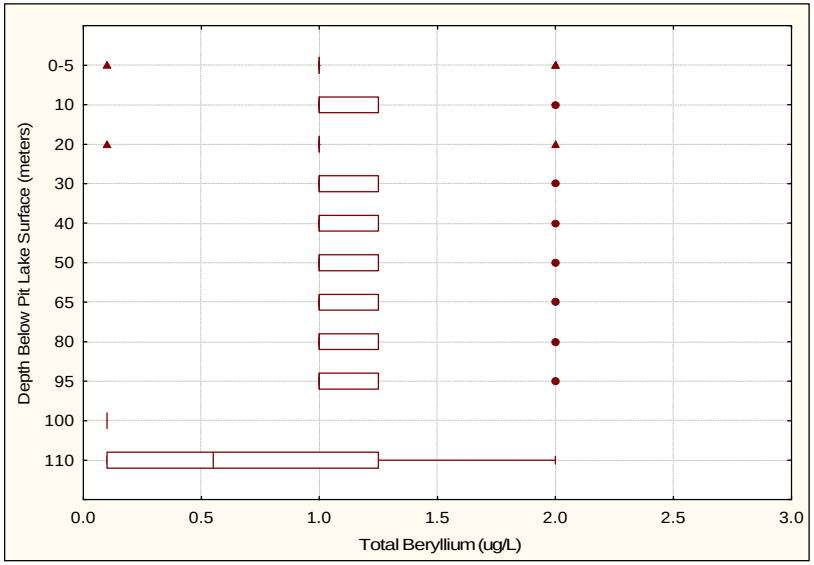

No Total Results

Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

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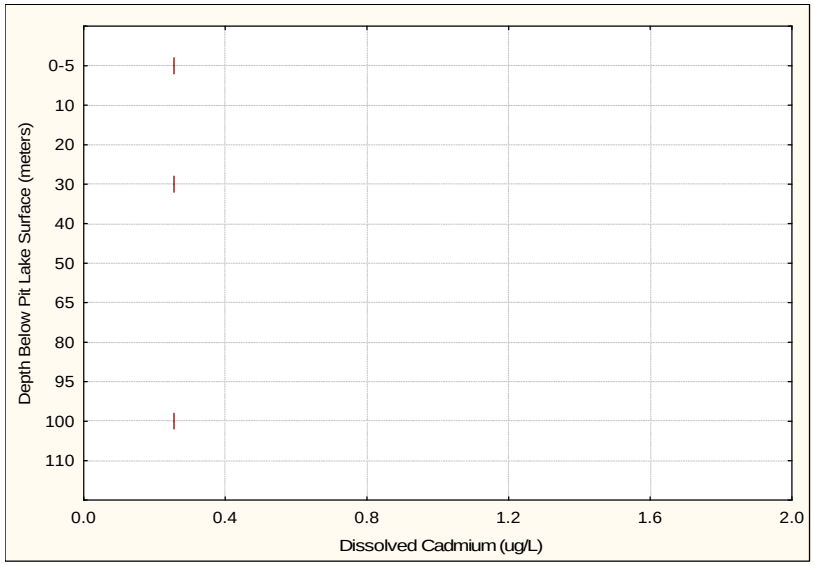

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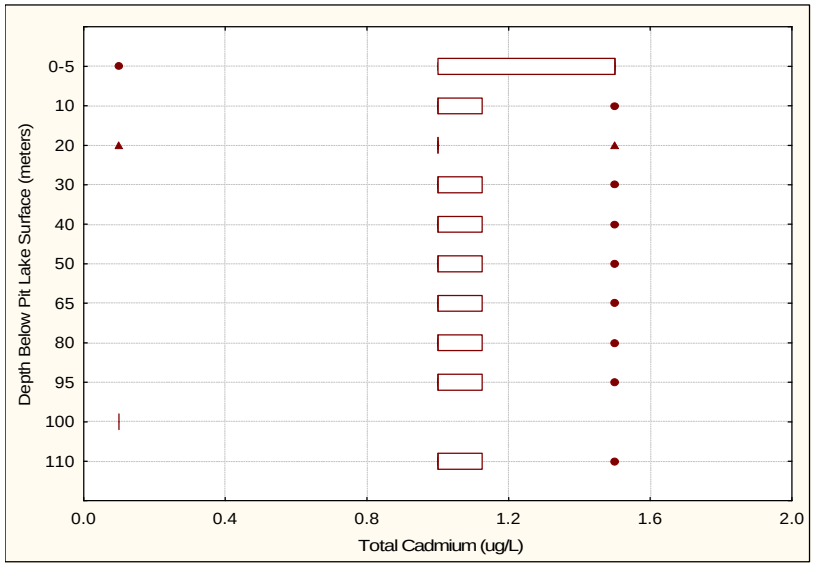

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Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

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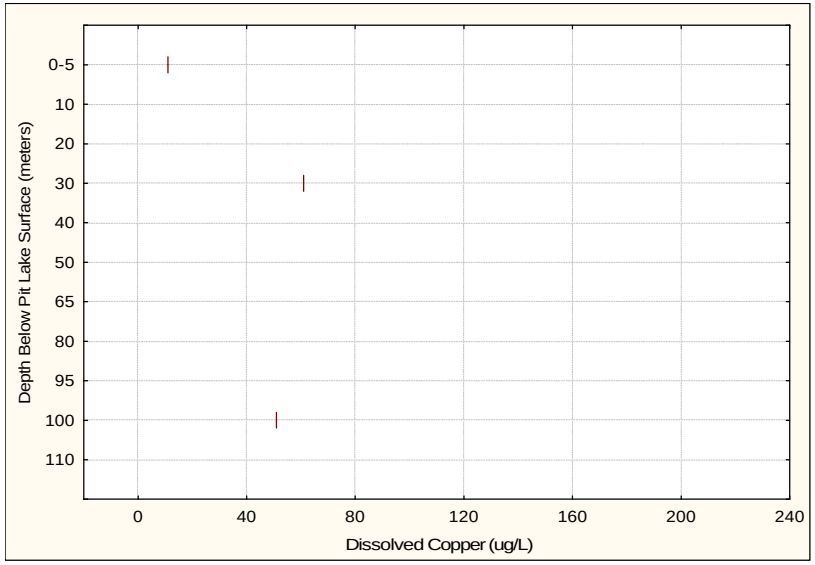

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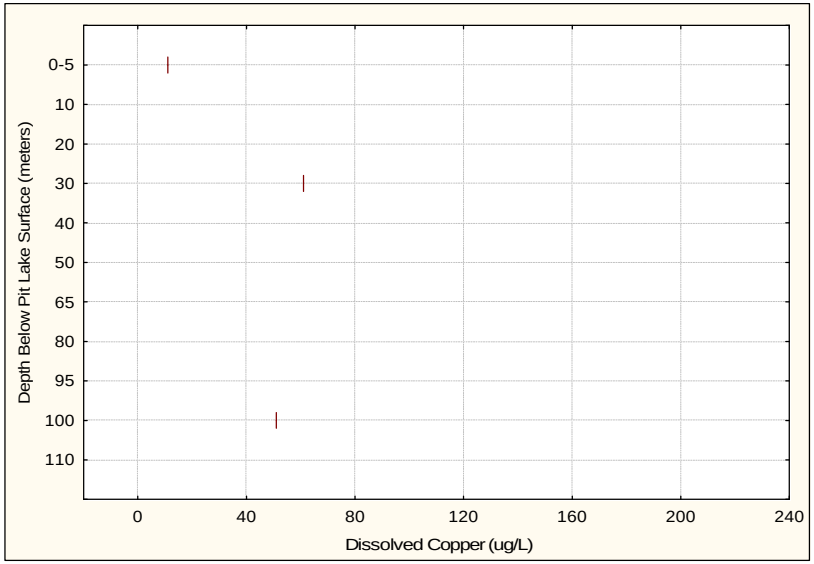

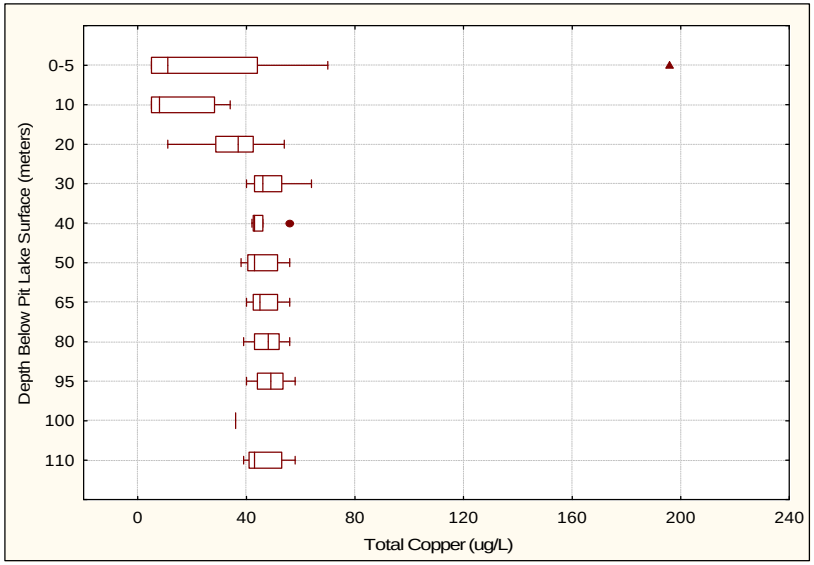

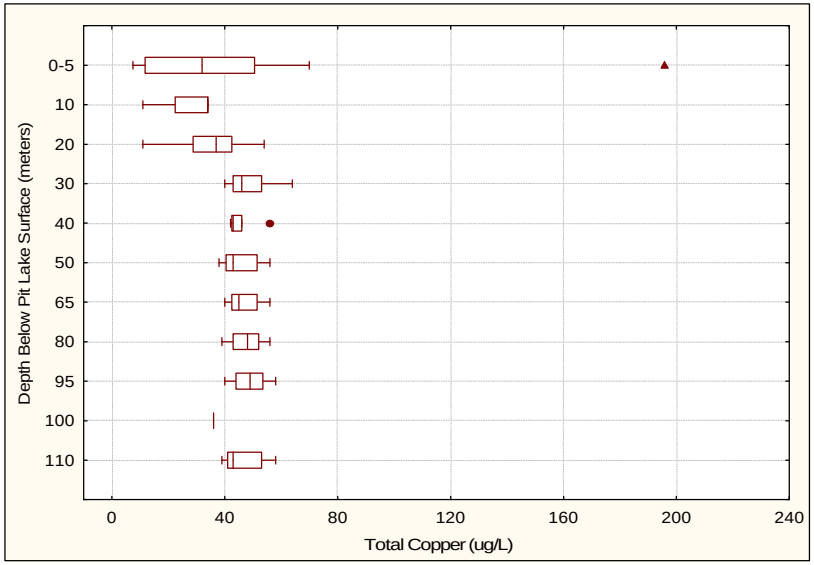

Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

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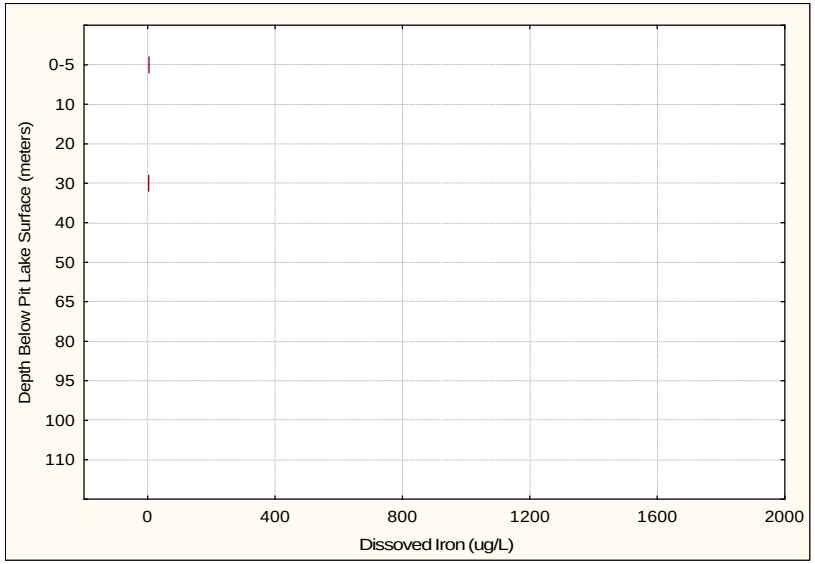

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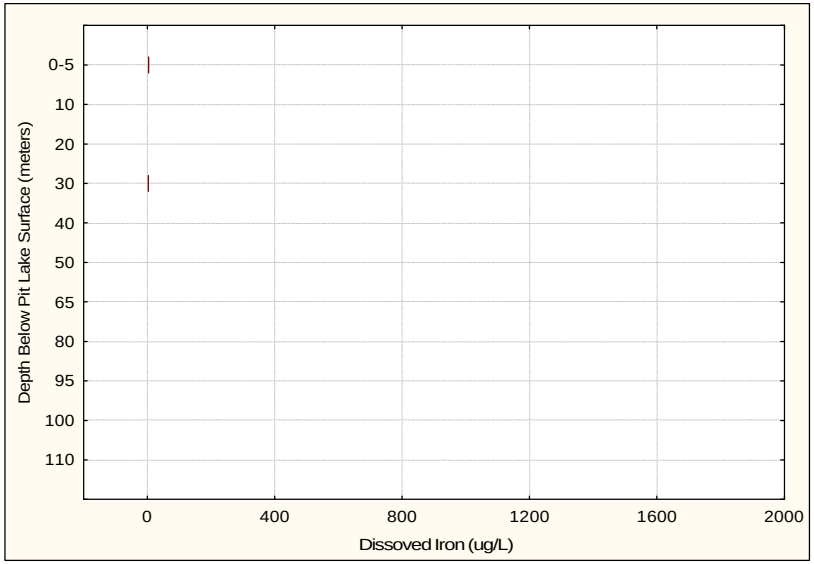
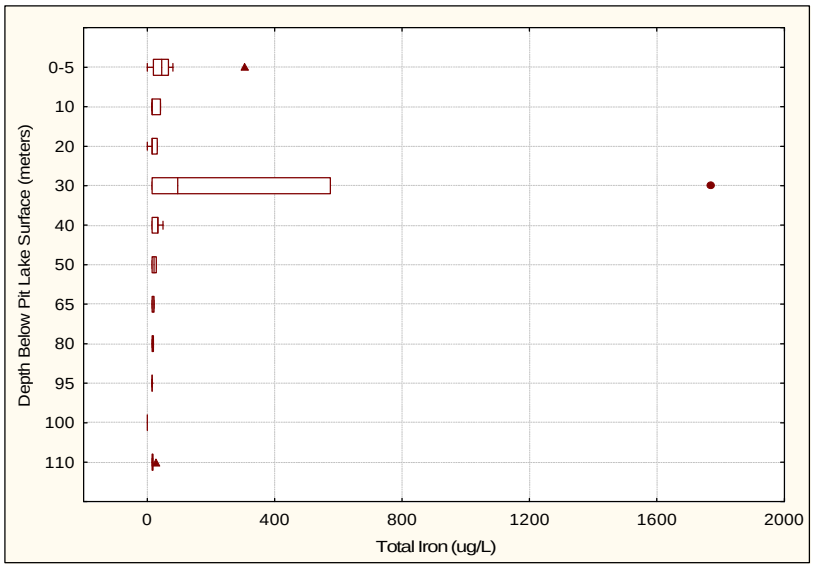




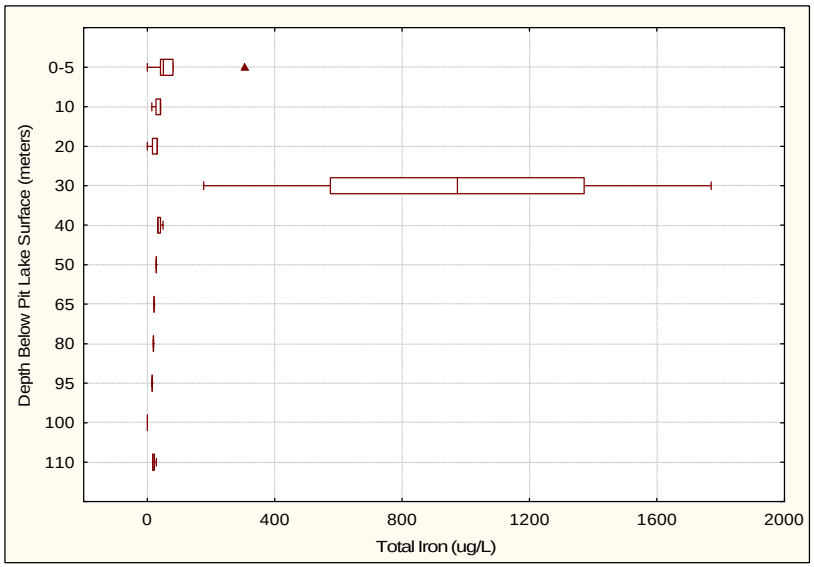
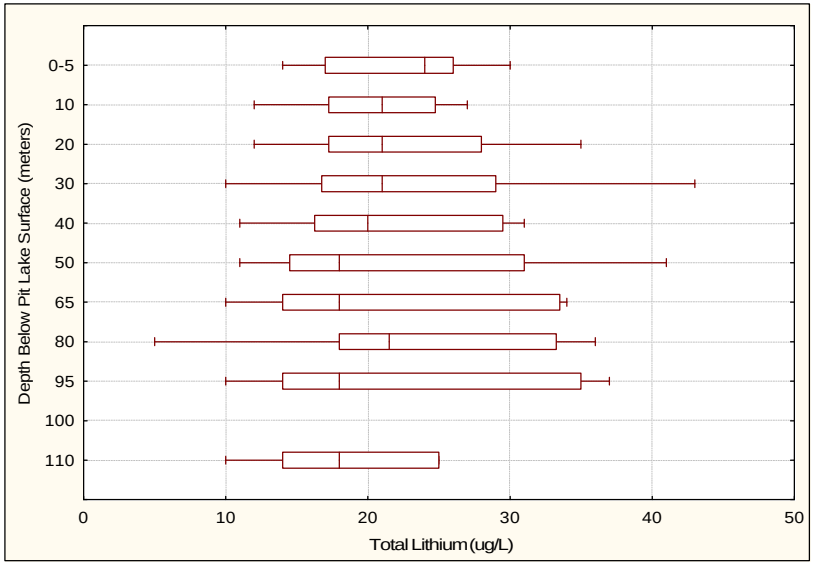


Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

Nondetects Included at 1/2 Reporting Limit:

No Dissolved Results



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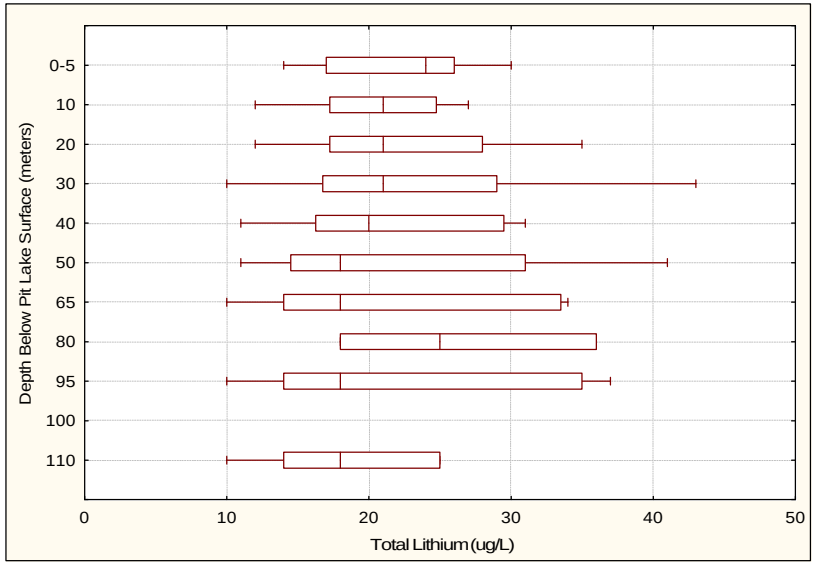

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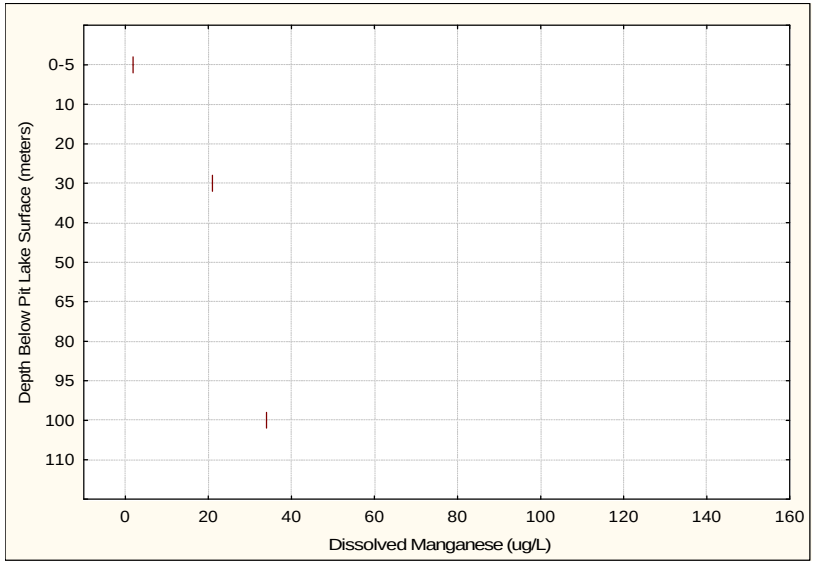

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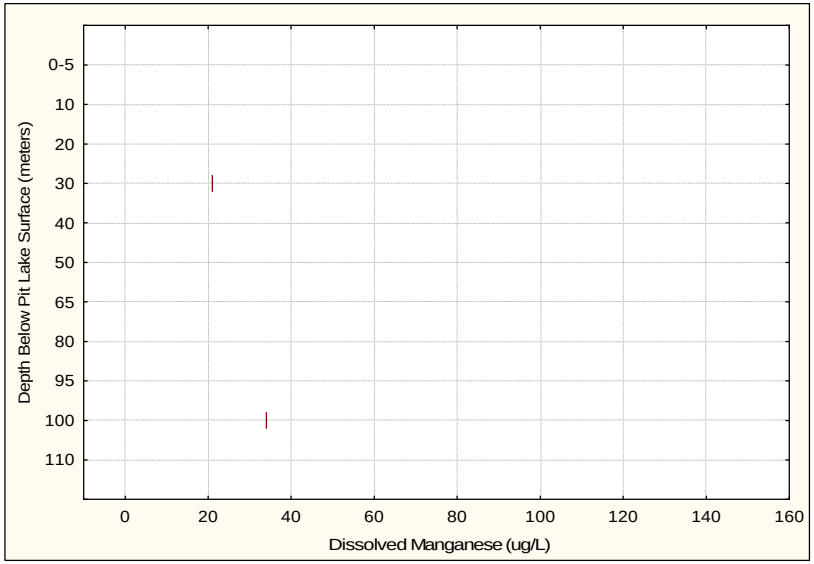

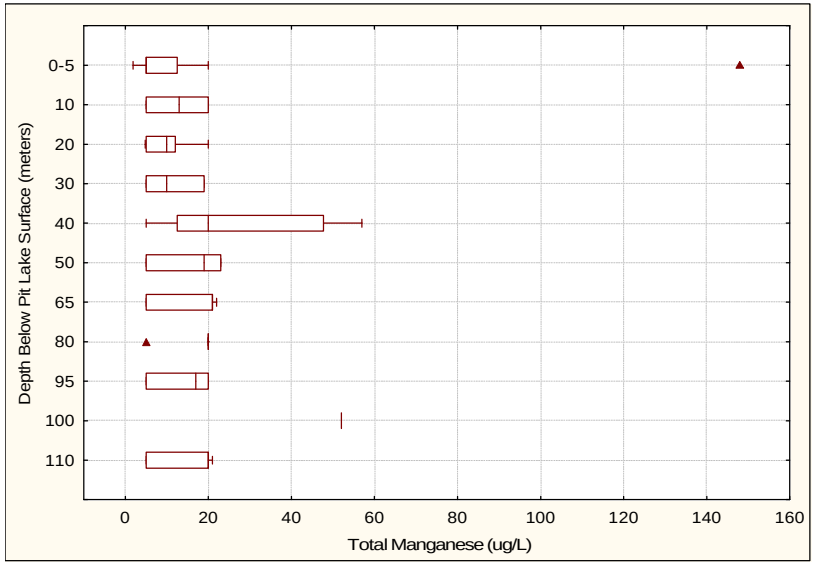

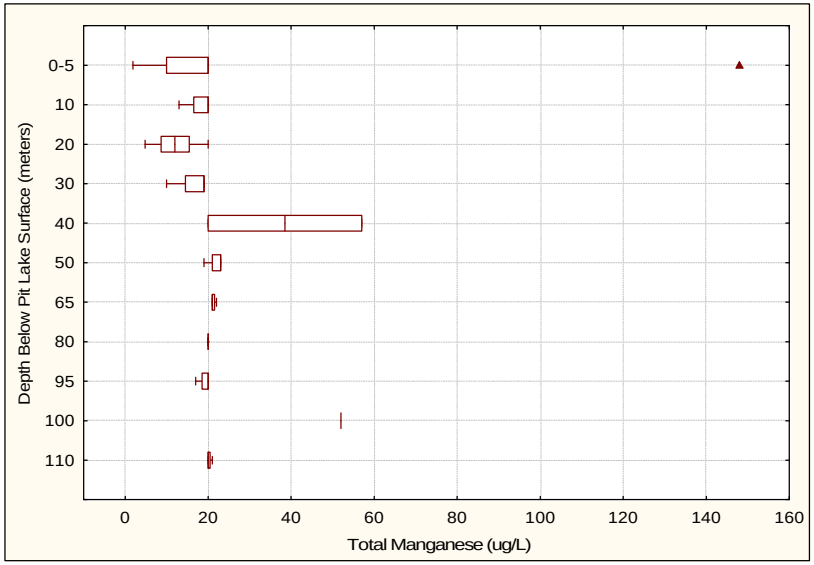

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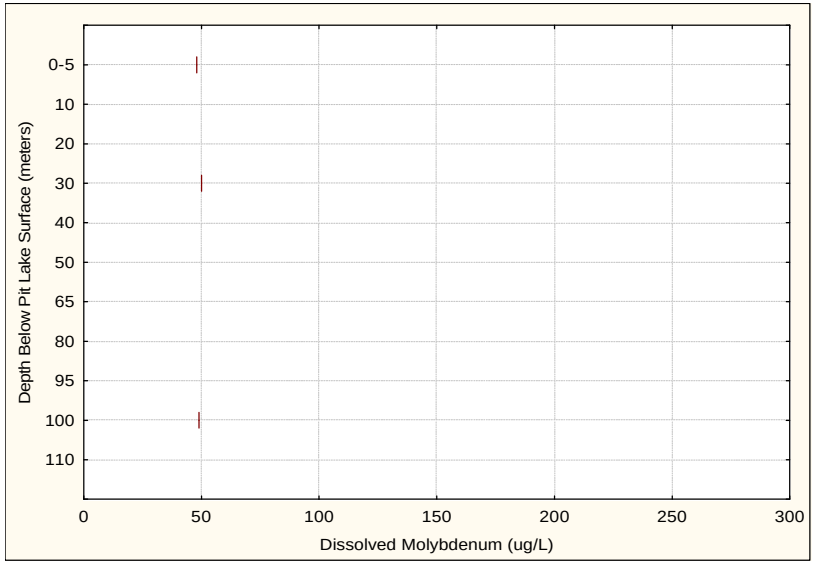

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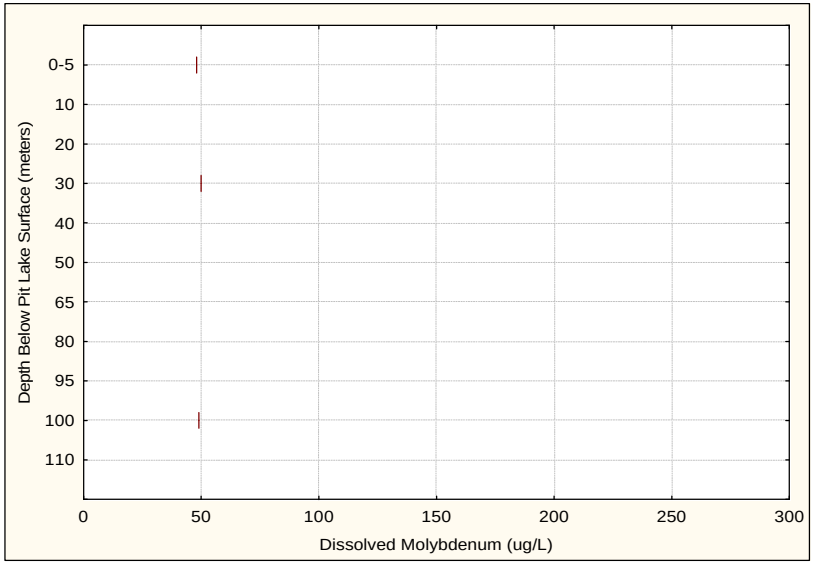

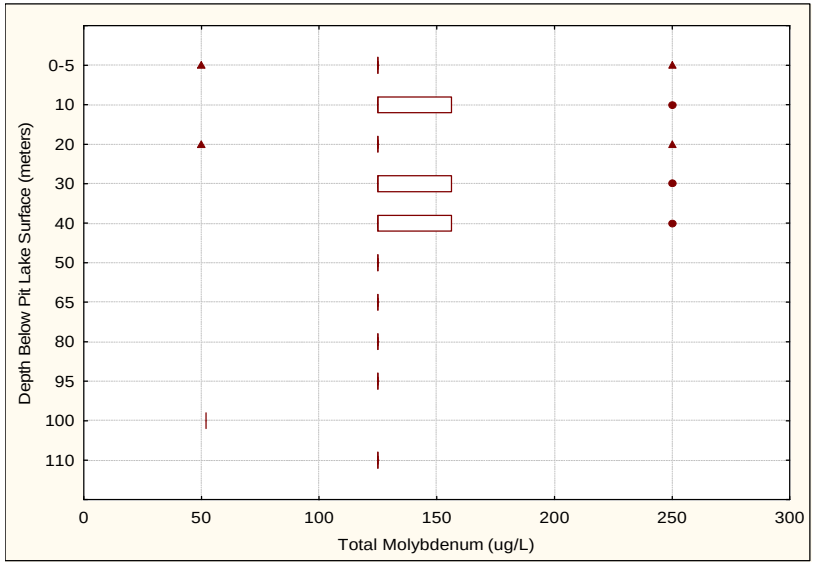

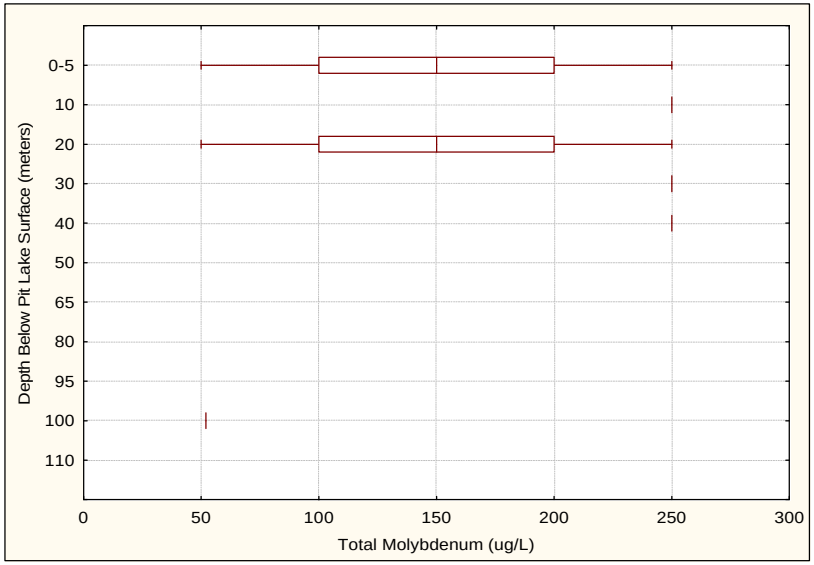

Figure 5. Boxplots of Metals Concentrations in Pit Water - May 1998 to August 2001

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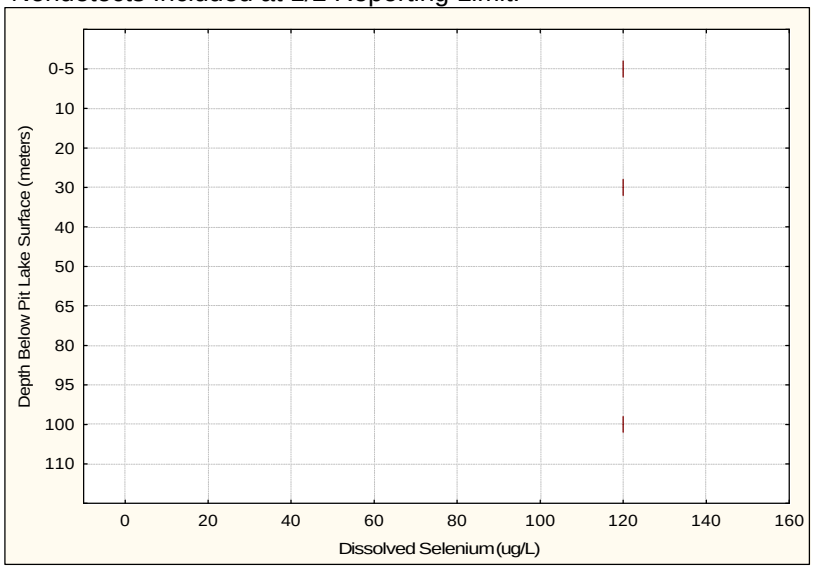

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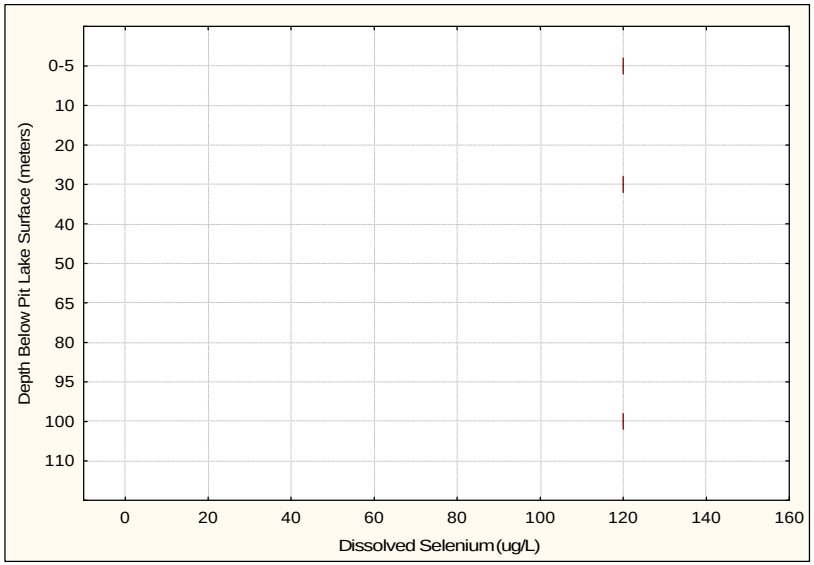

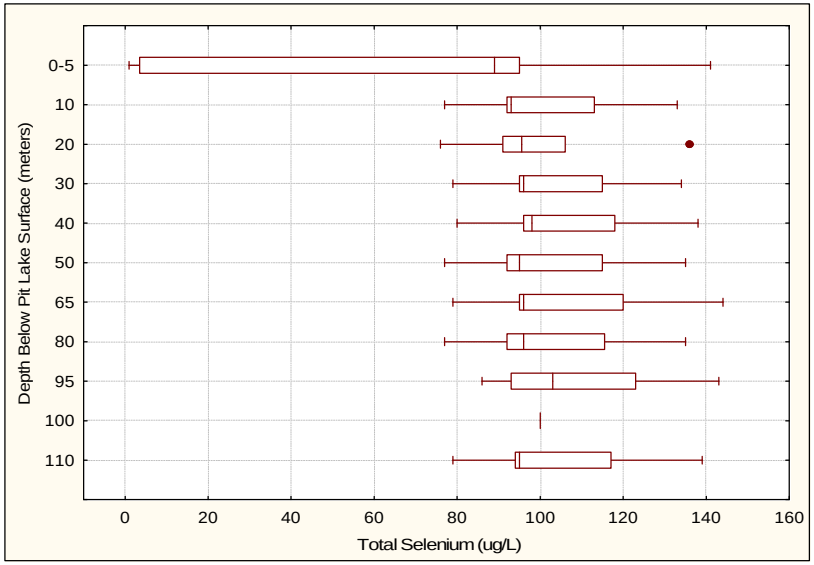

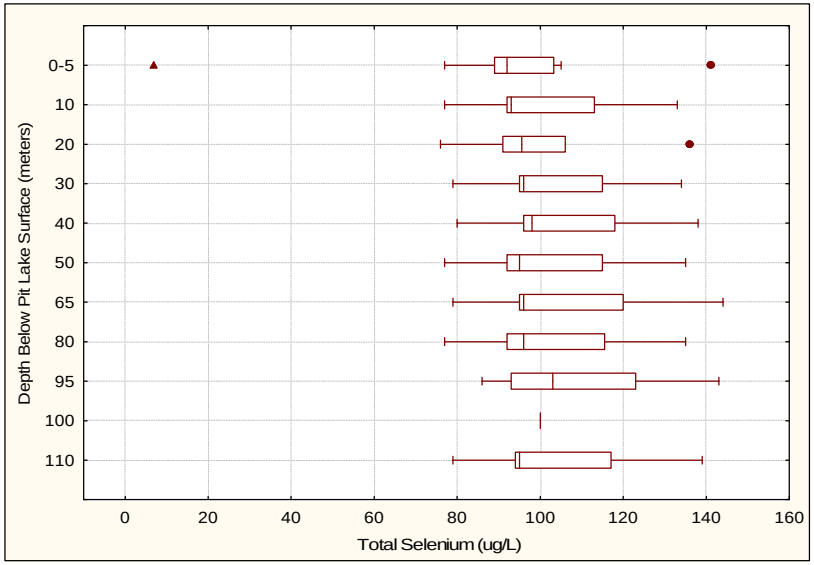

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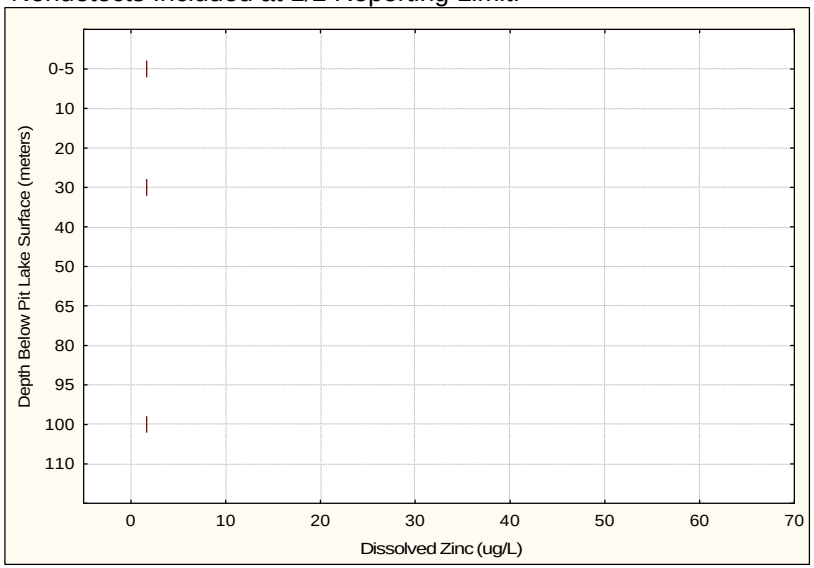

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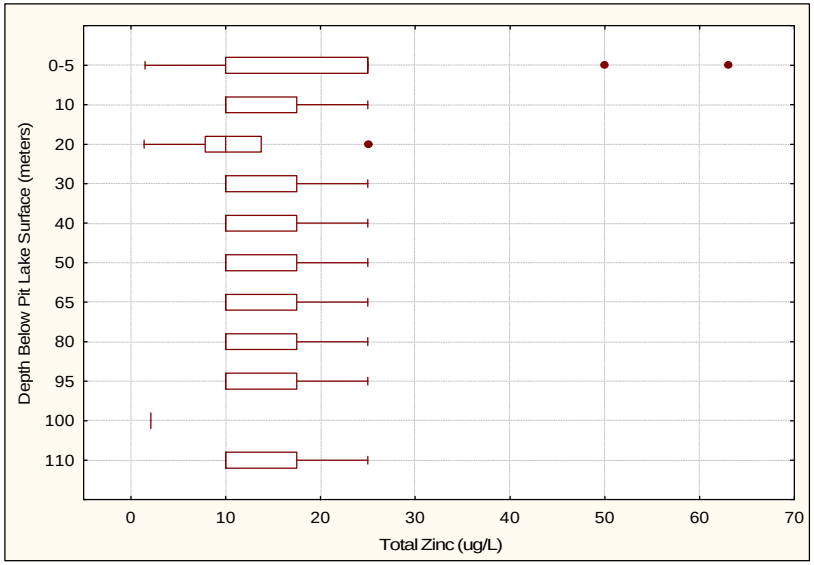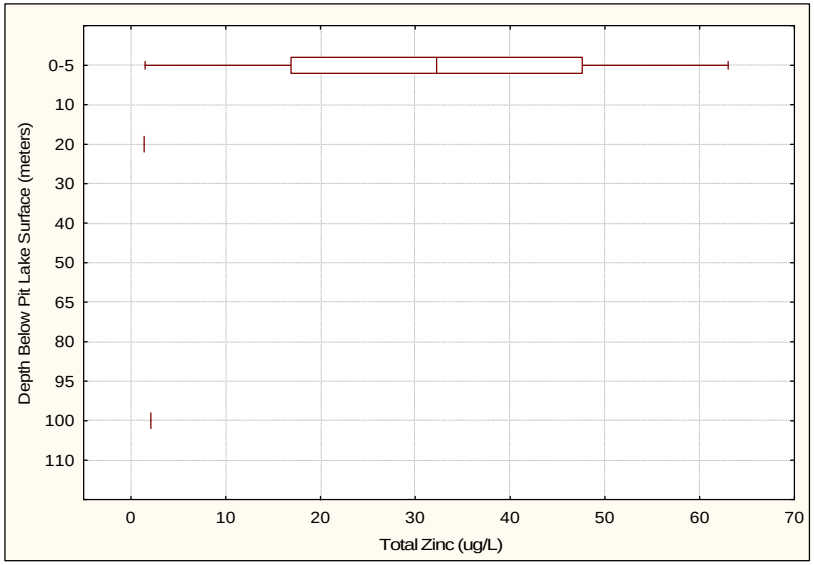
No Dissolved Results