Statistical analyses of the adequacy of the surface water quality monitoring network in Saskatchewan

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EXECUTIVE SUMMARY

Objectives

The main goal of this study is to assess the adequacy of the Saskatchewan surface water quality monitoring network. To achieve this goal, three specific objectives are defined as follows:

- Assessment of the location of sampling sites;
- Assessment and reselection of water quality variables to be measured;
- Assessment of sampling frequency.

Main Results

After performing a number of preliminary statistical analyses to assess the quality and distribution of the data, two multivariate approaches were used to evaluate potential similarities or redundancies between stations. To achieve this, the analysis was limited to ten water quality variables that were most frequently sampled at all stations. They are: Alkalinity, Dissolved Organic Carbon, Hardness, Dissolved magnesium, Dissolved potassium, Non-filterable Residues, Sodium, Temperature and pH.

Both multivariate methods, Principal Component Analysis (PCA) and Cluster Analysis (CA) indicate that numerous provincial stations have great similarities, while Environment Canada (EC) stations are less similar. Both PCA and CA show that the majority of EC stations have distinct water quality information. These stations are located on the Churchill, Qu'Appelle, Red Deer, Carrot and East Poplar Rivers.

In addition, Cluster analysis identified five provincial stations that seem to have unique information and that should be prioritized to remain in the network. They are: SK06AD0041, SK05JL0129, SK05JF0092, SK05HB0087 and SK05NB0198.

Both methods showed that there are a few pairs of stations with similar information. They are:

- Battle River (SA05FE0001) and SK05FF0020

- Assiniboine River (SA05MD0002) and SK05MC0038
- Churchill River (SA06EA0003) and SK06CD0027

Assessment of water quality variables was carried out for each of the MOE sampling site. The analysis was limited to water quality variables that were most frequently sampled at each sampling site. Results indicate that there are information redundancies among water quality variables and considerable number of variables could be discontinued. The maximum number of variables to be discontinued varies between five variables for sampling sites SK05HG0283 and SK05HH0267 and 14 variables at sampling site SK05JF0092. Detailed results for each sampling site are presented in Appendix G.

Water quality variables assessment was carried out for the EC sampling sites to identify variables that are measured by the EC network and may be added to the list of variables measured at MOE sites. This analysis was carried out for four pairs of EC and MOE sites that are considered similar and are located on the same watershed. Results showed that few variables may be added to the list of variables measured at two MOE sampling sites. Specifically, Lithium and Delta-Benzenehexachloride could be added to list of variables measured at Battle River (SK05FF0020). The 1,2,4,5-Tetrabromobenzene, 2,3-D, Clopyralid, Delta-Benzenehexachloride, Endrin, Gamma-Benzenehexachloride and Lithium could be added to the list of variables measured at Assiniboine (SK05MC0038). However, final decision for adding these variables should be taken after reviewing watershed attributes.

Sampling frequency was analyzed using a statistical estimation based on the confidence interval around the mean value of each water quality variable. Identification of the required number of samples to estimate the mean with minimum error varies between water quality variables and from site to site. Based on analyses carried out for each sampling site, the water quality variables may be divided into four groups. The first group of variables could be sampled four times per year to estimate the mean value with a relatively small margin of error. Water quality variables of the second and third groups would require respectively 6 and 12 samples per year to achieve a similarly acceptable level of error. Given the large variability, variables of the fourth group would require higher sampling frequency, perhaps as high as biweekly in order to get an estimate of the mean value with acceptable uncertainty. Detailed results for each water quality variable at each of the MOE sampling sites are presented in Appendix H. In general the following water quality variables require six samples per year, while other variables require larger number of samples:

- Alkalinity Total CaCO3
- Barium
- Bicarbonate
- Beryllium
- Boron
- Calcium Dissolved
- Calcium Total
- Carbon Dissolved inorganic
- Carbon Total inorganic
- Carbon Total
- Fluoride Dissolved
- Hardness Total CaCO3
- Specific Conductance
- Sulphate
- Total Dissolved Solids
- pH

1 INTRODUCTION

1.1 Context

Surface water quality monitoring is one of the responsibilities of a number of provincial and federal environmental departments in Canada.

In Saskatchewan, the Ministry of Environment (MOE) is responsible for 23 surface water quality monitoring stations. The sampling effort was initiated 40 years ago, and has been ongoing since with varying degrees of spatial and temporal coverage.

In recent years, one of the main uses of these water quality data is the calculation of a Water Quality Index (WQI, Lumb et al., 2006). The WQI is an attempt to summarize water quality data in order to provide managers and policy makers with the necessary information for decision-making. The WQI is based in part on the comparison of measurements with known standards or guidelines. The number of variables not meeting these standards, the frequency of exceedance and the amplitude of the exceedances are accounted for. A suite of water quality variables are therefore measured and compiled by MOE to perform these calculations. The adequacy of the sampling network to perform this task needs to be validated.

In addition to the 23 provincial water quality stations, Environment Canada (EC) monitors water quality at a number of sites in Saskatchewan. However, some of the EC stations are in close proximity to MOE monitoring stations. It is therefore possible that some redundancy exists in the joint EC-MOE network.

1.2 Objectives

The main goal of the present study is to provide a first statistical assessment of the surface water quality monitoring network in Saskatchewan. The specific objectives of the study include:

- Assessment of sampling frequency;
- Assessment of the location of sampling sites;
- Assessment and potential reselection of water quality variables to be measured.

2 METHODS

2.1 Water Quality Data

Two water quality datasets were used in this study. The first dataset was provided by the Environmental Protection and Audit division of the Ministry of Environment of Saskatchewan. The dataset consists of 23 sampling sites, through which the number of variables measured ranges from 36 to 51, with an irregular sampling frequency. Measurements span the period of January 1975 to February 2011.

The second dataset was provided by Environment Canada. The dataset consists of nine sampling sites, where more than 200 water quality variables are measured on irregular frequency since September 1966 to June 2010. Figure 1 shows the locations of both provincial and federal stations.

Both datasets exhibit large gaps and large number of censored data. Several preparation steps were carried out before data analyses took place.

The first preparation step was to remove censored data. These data include measurements labelled as 'less than' or 'below detection limit'. Below detection data arise as a result of the technological limits of laboratory instrumentation (Zhu and McBean, 2004). Since the actual value remains uncertain, the censored data were removed.

The second preparation step was to rearrange data on a monthly basis, to identify the gaps. In some cases there were two samples taken during the same day or month, which were analyzed for different water quality variables, and considered as complementary samples. In this case, the two samples were combined to have one set of water quality observations for this month.

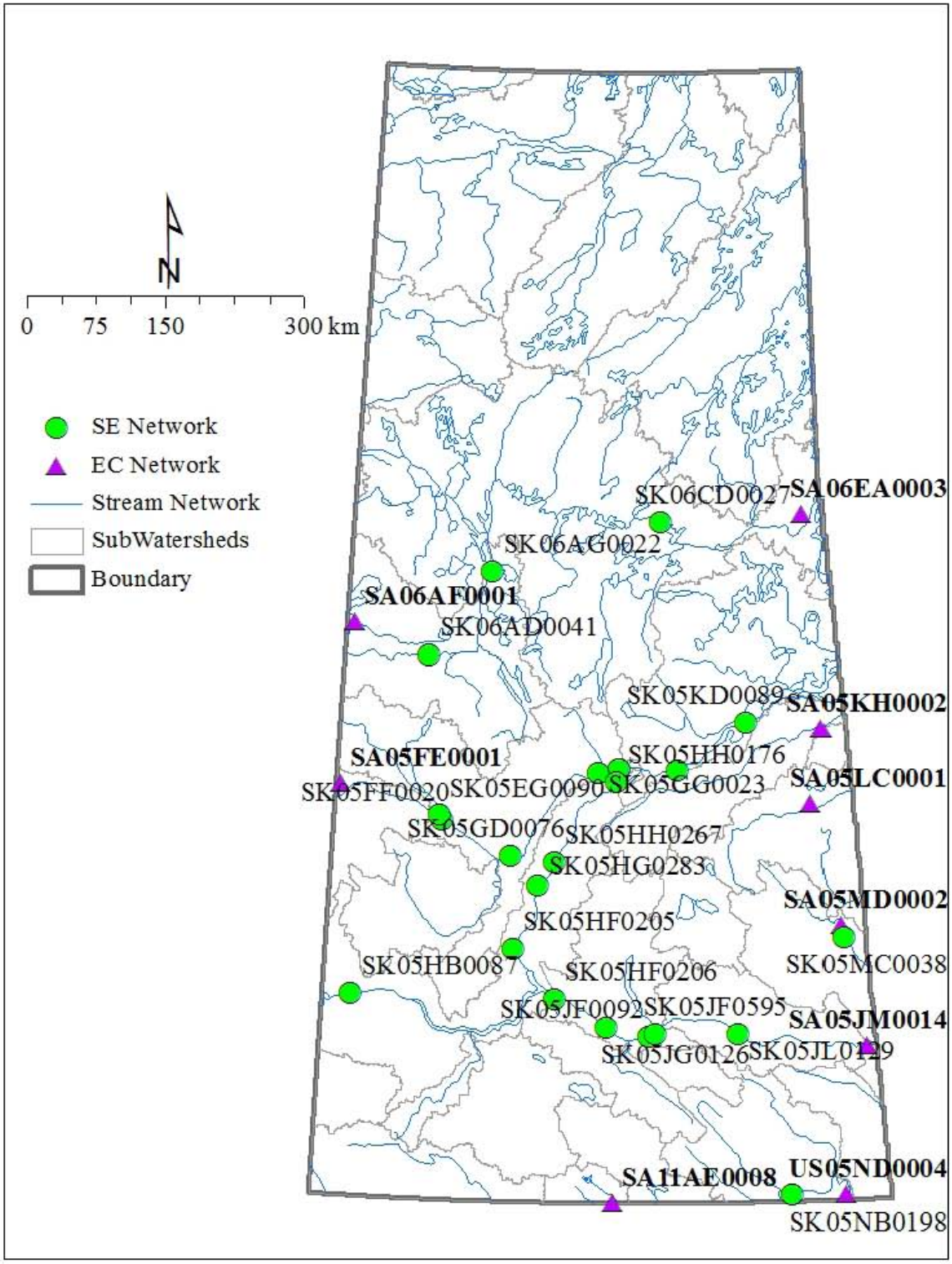

Figure 1. Map showing sampling sites

The third preparation step was to screen both datasets to identify water quality variables that have 30 or more valid records during the monitoring period from September 1966 to February 2011. Water quality variables that have less than 30 records were excluded from further analysis. Two sites were thus excluded:

- Sampling site US05ND0004 at the Souris River near Sherwood, where only twelve samples were collected from September 1999 to August 2010 (The maximum number of observations available is 12); and
- Sampling site SK05JF0595 at the Qu'Appelle River (SA05JM0014), where sampling started on May 2006 and ended on November 2007 (The maximum number of available observations is 9).

In the fourth step, a logical check was performed to identify potential outliers or faulty data to be removed. For example:

- Fecal Coliform was 60 no/100 ml while Total Coliform was only 20 no/100 ml (Sample 2005003713, 14/9/2005 at Station SK06AD0041);
- Dissolved Silver was 0.011 µg/l while Total Silver was 0.007 µg/l (Sample 2004PN090017, 12/5/2004 at Station SA05FE001, Battle River);
- Dissolved Selenium was 0.29 µg/l and 0.13 µg/l while Total Selenium was 0.28 µg/l and 0.09 µg/l for samples 2003PN090054 and 2003PN090100 respectively. These samples were taken on 22/7/2003 and 5/11/2003, respectively, at Station SA05FE001, Battle River;
- Dissolved Antimony was 0.114 µg/l while Total Antimony was 0.112 µg/l (Sample 2009PN290242, 20/1/2010 at Station SA05KH0002, Carrot River).

In the fifth step, any variable that has more than 30 valid records were included in the assessment of sampling frequency. For the assessment and redistribution of monitoring locations, variables that have more than 30 records and being measured at all 22 MOE sampling sites and nine Environment Canada sites were included. Only ten water quality variables were selected based on these criteria. They are shown in Table 1.

Table 1. Water quality variables (WQV) selected for the assessment and redistribution of sampling sites

WQV	Alkalinity Total CaCO3	Carbon Dissolved Organic	Chloride Dissolved	Hardness Total CaCO3	Magnesium Dissolved
Units	mg/l	mg/l	mg/l	mg/l	mg/l
WQV	Potassium Dissolved	Residue Non-filterable (TSS)	Sodium Dissolved	Temperature	pH
Units	mg/l	mg/l	mg/l	deg C	pH units

2.2 Statistical Analyses

The first step in the methodology is to carry out preliminary analyses in order to understand the water quality data characteristics and to check the statistical assumptions required to apply the designed statistical approaches. Statistical methods are then applied to assess the sampling frequency (section 2.2.1) and sampling locations (section 2.2.2).

2.2.1 Preliminary analyses

The preliminary analyses applied in this study include: calculation of descriptive statistics, tests to check normality in the distribution of each water quality variable, existence of trend and autocorrelation. The descriptive statistics include measures of central tendency (mean, median), dispersion (variance, standard deviation, maximum and minimum) and the shape of the distribution (skewness, kurtosis). Kolomogrov-Smirnov goodness of fit test was applied to check normality. Modified Mann-Kendall autocorrelation test was applied for trend detection. The detailed method for each test is provided in Appendix A.

2.2.2 Statistical methods for the assessment of sampling locations

The proposed approach for the assessment and rationalization of sampling sites is based on two multivariate statistical techniques. These techniques are the principal component analysis (PCA) and cluster analysis (CA).

PCA calculates linear combinations of the original water quality variables. These linear combinations must satisfy different criteria: 1) the linear combinations must explain the maximum possible variability in the original data set; and 2) the sum of the weights of the linear combination must equal 1. The first principle component (PC1) is therefore the linear combination of the original variables that explains the largest proportion of the sample variance. The second principal component (PC2) will be a linear combination of original variables that maximizes explained residual variance (i.e. variance left once PC1 is removed) and so on. Typically, the first few (e.g. 3) PCs will explain the majority of the sample variance. It is then possible to calculate the coordinates of each station associated with PC1, PC2, PC3, etc. These coordinates, called scores, can be plotted in PC space (a Cartesian coordinate system in which PC1 is the X coordinate and PC2 or PC3 is the Y coordinate). Stations that are close together in PC space are similar. Potential redundant stations can thus be identified.

CA is an exploratory data technique used to group similar observations into clusters, where the within-cluster variance is minimized and the between-cluster variance is maximized (Jobson, 1992). An agglomerative hierarchical cluster algorithm was employed to identify clusters of similar sampling sites based on their principle component scores.

The main objective from the proposed approach is to identify similar sampling sites and possible sites to be discontinued. This approach consists of four main steps. In the first step, PCA is employed to convert original water quality variables into new uncorrelated variables (principle components) for each of the monitoring sites. In the second step, monitoring sites are projected in PC space to identify similar stations. The third step is to verify the conclusions of PCA using CA. The forth step is to identify the optimal combination of sites to discontinue using an information index.

Assume that the variable y measured at a discontinued monitoring location *Y* has n_1 years of data and that the variable x measured at a continuously monitored location *X* has $n_1 + n_2$ years of which n_1 are concomitant with the data observed at *Y*, illustrated as follows:

$$Location\ (X): x_1, x_2, x_3, ..., x_{n_1}, x_{n_1+1}, x_{n_1+2}, ..., x_{n_1+n_2}$$
$$Location\ (Y): y_1, y_2, y_3, ..., y_{n_1}$$

Consider that year n_1 is the year when the assessment and redesign took place. After n_1 years, a decision is made to stop monitoring at location *Y* and continue measuring at location *X*. Assume that after n_2 years, our interest is to reconstitute information about water quality variables at discontinued locations. Matalas and Jacobs (1964) developed a procedure for obtaining unbiased estimators of the mean (μ_y) and the variance (σ_y^2), showing that the mean value ($\hat{\mu}_y$) of the extended *Y* series can be determined using the following equation:

$$\hat{\mu}_y = \bar{y}_1 + \frac{n_2}{n_1 + n_2}\hat{\beta}(\bar{x}_2 - \bar{x}_1) \qquad \textbf{(1)}$$

where $\bar{y}_1$ and $\bar{x}_1$ are the mean values of y_i and x_i, respectively, based on the short records $i = 1,...,n_1$, $\bar{x}_2$ is the mean value of x_i observed during the period $i = n_1 + 1,....,n_2$ and the parameter $\hat{\beta}$ is the estimated regression coefficient. Based on this formulation, it is possible to show (Cochran, 1953) that the variance of $\hat{\mu}_y$ is given by:

$$Var\{\hat{\mu}_y\} = \frac{\sigma_y^2}{n_1}\left[1 - \frac{n_2}{n_1 + n_2}\left(\rho^2 - \frac{1-\rho^2}{n_1 - 3}\right)\right] \qquad \textbf{(2)}$$

where σ_y^2 is the population variance of y and ρ is the population correlation coefficient between x and y. For practical use, these values may be replaced by their estimates based on the n_1 years of data (Ouarda et al, 1996).

To define the optimal combination of sampling sites to be continuously measured and those to be discontinued, consider the case where *k* sampling sites to be discontinued. Which *k* sites among the available 23 MOE sites should be selected? The number of possible combinations of sites to discontinue is given by the binomial coefficient C(23,k). For each combination, an information index is employed according to which the combinations may be ranked. Such a procedure allows the identification of the best combination of sampling sites to discontinue, or provides the decision maker with the rank of the best combinations to discontinue. An aggregated information index (I_a) is defined as follows:

$$I_a = \sum_{Sites} \sum_{variables\ X} \sqrt{Var\{\hat{\mu}\{X\}\}} \qquad \textbf{(3)}$$

where X is the water quality variable and $Var\{\hat{\mu}\{X\}\}$ is the variance of the mean value estimator expected after n_2 years. This summation is carried out over selected water quality variables and over all the sites. For the discontinued sites, the variance of the mean value estimator after n_2 years is estimated using Equation 2. For continuously measured variables, the variance of the mean value after n_2 years is assumed to be equal to the variance of the mean after n1 years multiplied by $(n_1-1)/(n_1+n_2-1)$ (Khalil et al., 2010a). The proposed approach details are presented in Appendix B.

2.2.3 Water quality variables rationalization

The Correlation-Regression (CR) approach is the most commonly used statistical approach to reduce the number of water quality variables being measured. As described by Khalil and Ouarda (2009) the CR approach is based on three steps: First, correlation analysis is used to assess the level of association among the variables being measured. If high correlation exists among the variables, some of the information produced may be redundant. Second, the water quality variables to be continuously measured or discontinued are selected. This step is based on some subjective criteria, such as the significance of the variable, the presence of the variable in local or international standards. It may be based also on the cost of laboratory analysis. Third, the reconstitution of information about the discontinued variables using auxiliary variables from the continuously measured variables is examined.

Khalil et al. (2010a) modified the CR approach to overcome two main deficiencies. The first deficiency involves the method used to identify highly associated variables. The correlation coefficient is commonly used as a criterion to assess the level of association, but selection of the proper threshold above which a correlation coefficient can be considered sufficient to associate two variables can be problematic. Assessment of the correlation coefficient is always based on subjective preference. Thus, studies using the same variables but performed by different investigators may lead to different results. The second deficiency is the absence of a criterion to identify the combination of variables that should be continuously measured or discontinued. In the modified CR, Khalil et al. (2010) used criteria from record-augmentation procedures to identify a correlation coefficient threshold; and an information index to identify optimal combinations of variables to be continuously measured and variables to discontinue.

The approach proposed by Khalil et al. (2010a) consists of three main steps. The first step involves correlation analysis, cluster analysis and correlation coefficient threshold to assess the level of association among the variables being measured and to define the groups of variables that are highly associated. Then, for each highly associated group of variables, the second step is to assume that each variable within the group would be discontinued and to identify the best auxiliary variable from the same group. The third step is to assess different combinations of variables to be discontinued and variables to be continuously measured using an information index. In this study, the approach proposed by Khalil et al. (2010a) was applied to identify optimal combinations of variables to be continuously measured and variables to discontinue for the Saskatchewan water quality monitoring network. Figure 2 illustrates the flow of the analyses. Detailed analyses are described in Appendix C.

The same approach was applied for Environment Canada water quality monitoring network. The objective was to identify if some of the extra variables that are measured through the EC monitoring network should be measured by the MOE network. The extra EC variables were assessed relative to other variables within each of the EC sampling sites separately. If the extra variable is highly correlated with one of the MOE variables, it indicates that there is information redundancy and therefore there is no need to add this variable to the MOE network. If the extra variable is not highly correlated with one of the MOE variables, it indicates that this variable may be added to the list of variables measured by the MOE.

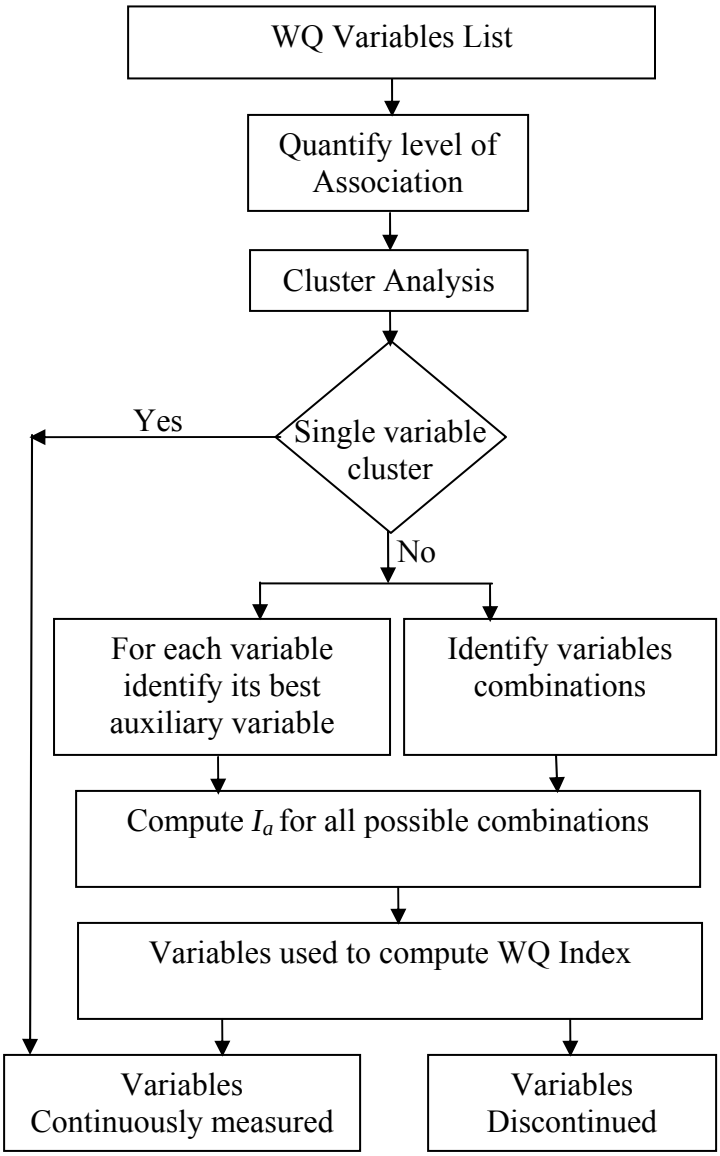

Figure 2. Flow chart of the proposed rationalization approach (modified, based on Khalil et al, 2010a Figure 2)

2.2.4 Statistical method to estimate the appropriate sampling frequency

In this study the confidence interval around the mean is used as a criterion for the assessment of the sampling frequency. This approach assumes that the monitoring objectives are the determination of ambient water quality status and an assessment of annual means.

The confidence interval approach allows selecting a sampling frequency that yields an estimate of the sample mean ($\bar{x}$) within a prescribed degree of accuracy (confidence limits) (Khalil et al., 2011).

A formula for sample size is based on the assumption that the water quality observations are stationary (i.e. no temporal trends). Based on the preliminary analyses, water quality variables that exhibit trend were de-trended, and then examined for autocorrelation. If autocorrelation function is not significant at lag-1, the original formula proposed by Sanders and Adrian (1978) was used.

$$n \geq \left[\frac{t_{\alpha/2}\, s}{E} \right]^2 \qquad \textbf{(4)}$$

where n is the number of samples that need to be taken to estimate the mean with an error *E*, at a level of confidence 1-α , s is the sample standard deviation, $t_{\alpha/2}$ is the Student's "*t*" statistic at an acceptable confidence level (1-α) and the error (E) is the difference between the true population mean and the sample mean ($\mu - \bar{x}$). In this study E is considered as a percentage of the sample mean. Hence the minimum number of samples required is always given for a pre-stated error level, which is deemed acceptable by the manager. In the present analysis, different error levels were tested.

In case the autocorrelation function is significant, the modified formula provided by Loftis and Ward (1979) and simplified by Gilbert (1987) was used in this study.

$$n = D\left[1 + 2\sum_{k=1}^{n-1} \rho_k\right] \qquad \textbf{where } D = \left[\frac{(t_{\alpha/2})\, s}{E}\right]^2 \qquad \textbf{(5)}$$

where ρ_k is the autocorrelation coefficient for lag k, s^2 is the sample variance, A detailed mathematical explanation is provided in Appendix D.

3 RESULTS

3.1 Preliminary analyses

The results of the preliminary analyses for sampling site SK05HG0283 are presented here as an example of the preliminary analyses applied for each of the sampling sites under assessment. Detailed results for each sampling site are presented in Appendix E. Following data preparation and validation, 19 water quality variables were considered for further analyses at sampling site SK05HG0283. Table 2 shows the descriptive statistics for the 19 water quality variables measured at sampling site SK05HG0283. The maximum number of monthly records available ranges between 31 observations for Dissolved Oxygen to 39 observations for Total Alkalinity (CaCO3), Bicarbonate, Dissolved Chloride, Total Phosphorus, Fixed Non-filterable Residues (FSS), Non-filterable Residue (TSS) and pH.

For sampling site SK05HG0283, the average and median for most of the variables were very similar, indicating that the distributions of the measurements of each of these variables were essentially symmetric. The Fecal Streptococci shows a large difference between the average and the median, where the average is two folds the median value. The coefficient of variation is the ratio of the standard deviation to the average. The coefficient of variation indicated a low variability for 7 of the 19 variables considered at this sampling site. Low coefficients of variation range between 2.1% for pH to 11% for Sodium. Three variables show high coefficient of variation, 86% for Water Temperature, 98% for Total Phosphorous and 128% for Fecal Streptococci.

The skewness and kurtosis values for most of the variables indicated that the observations were symmetric around their mean value, with normal tails. Large tails and strong positive skewness were detected for the Dissolved organic Carbon, Fecal streptococci, Total Kjeldahl Nitrogen, Oxygen Dissolved and Total Phosphorous while negative skewness was detected for pH.

Table 2: Descriptive statistics of station SK05HG0283.

WQV	Alkalinity Total CaCO3	Bicarbonate (CALCD.)	Calcium Dissolved	Carbon Dissolved Organic	Chloride Dissolved	Fecal Streptococci
no.	39	39	38	37	39	34
Average	157.769	186.416	47.1316	4.5811	8.0333	201.824
Median	160	188	47	4.4	8.3	100
Standard deviation	6.1877	8.7709	2.0424	1.6031	1.6007	258.275
variance	38.2874	76.9292	4.1714	2.5699	2.5623	66705.8
Minimum	144	163	43	3	2	2
Maximum	167	203	51	12.2	11.8	970
Skewness	-0.6978	-0.6968	-0.2765	3.2972	-1.2089	1.5854
Kurtosis	2.4717	3.5024	2.4952	15.7089	6.7582	4.6737
WQV	Hardness Total CaCO3	Magnesium Dissolved	Nitrogen Dissolved Nitrate	Total Kjeldahl Nitrogen	Oxygen Dissolved	Phosphorous Total
no.	38	38	34	33	31	39
Average	188.526	17.2368	0.2021	0.363	11.9326	0.0444
Median	190	17	0.22	0.3	10.44	0.03
St-dev	8.7972	1.0764	0.0586	0.2363	5.0792	0.0438
variance	77.3912	1.1586	0.0034	0.0558	25.7981	0.0019
Minimum	169	15	0.09	0.2	7.66	0.02
Maximum	210	20	0.3	1.5	30.66	0.25
Skewness	-0.2506	-0.2188	-0.4653	3.6538	2.7654	3.5162
Kurtosis	2.9523	3.3062	2.1133	17.5815	10.2933	15.7115

Table 2: Descriptive statistics of station SK05HG0283(continued).

WQV	Residues Fixed Non-filterable (FSS)	Residue Non-filterable (TSS)	Sodium Dissolved	Sulphate Dissolved	Temperature Water	Turbidity (NTU)	pH
no.	39	39	38	34	32	38	39
Average	9.3333	11.1795	23.8158	70.4941	10.1472	4.1597	8.3333
Median	8	9	24	71.7	10.85	3.45	8.4
St-dev	6.1786	6.4313	2.5559	7.0182	8.7629	2.3979	0.1782
variance	38.1754	41.3617	6.5327	49.2557	76.7889	5.7497	0.0318
Minimum	1	3	18	58.2	0	1.07	7.4
Maximum	26	29	29	90.9	25.7	12	8.6
Skewness	1.0696	1.1486	-0.4613	0.5166	0.1965	1.3974	-3.6801
Kurtosis	3.4955	3.6427	2.8947	3.8152	1.5924	4.7245	20.5857

To check normality, the Kolmogorov-Smirnov goodness of fit test was used (Table 3). The test results indicated that the null hypothesis (data are normally distributed) cannot be rejected at a 5% level of significance (*p*-value is the probability of accepting the null-hypothesis) for most of the variables (Table 3), whereas for 6 variables, the null hypothesis cannot be accepted. For the variables that do not follow the normal distribution, Box-Cox transformation was applied to achieve normality.

Table 3: Kolgomorov-Smirnov test for station SK05HG0283.

Water Quality Variables	**Most Extreme Differences**			**Kolmogorov-Smirnov Z**	***p*-value**
	Absolute	**Positive**	**Negative**		
Alkalinity Total CaCO3	0.153	0.073	-0.153	0.942	0.338
Bicarbonate	0.200	0.085	-0.200	1.232	0.096
Calcium Dissolved	0.159	0.101	-0.159	0.977	0.295
Carbon Dissolved Organic	0.296	0.296	-0.162	**1.798**	**0.003**
Chloride Dissolved	0.131	0.108	-0.131	0.806	0.534
Fecal Streptococci	0.271	0.271	-0.220	**1.582**	**0.013**
Hardness Total CaCO3	0.119	0.119	-0.119	0.734	0.653
Magnsium Dissolved	0.208	0.187	-0.208	1.283	0.074
Dissolved NitrogenNitrate	0.150	0.077	-0.150	0.873	0.432
Total Kjeldahl Nitrogen	0.325	0.325	-0.256	**1.839**	**0.002**
Oxygen Dissolved	0.269	0.269	-0.198	**1.473**	**0.026**
Total Phosphorous	0.301	0.278	-0.301	**1.832**	**0.002**
Residue Fixed Non-fiterable (FSS)	0.147	0.147	-0.110	0.904	0.388
Residue Non-filterable (TSS)	0.162	0.162	-0.124	0.996	0.275
Sodium Dissolved	0.138	0.091	-0.138	0.850	0.465
Sulphate Dissolved	0.150	0.150	-0.086	0.872	0.432
Temperature Water	0.200	0.200	-0.128	1.116	0.166
Turbidity (NTU)	0.187	0.187	-0.099	1.154	0.139
pH	0.304	0.240	-0.304	**1.874**	**0.002**

The modified Mann-Kendall non-parametric trend test was applied. Table 4 shows the results for the variables measured at sampling site SK05HG0283. The Z statistic and the probability of accepting the null hypothesis (p-value) suggested there was no trend in most of the variables measured at this sampling site. The null hypothesis could not be rejected for any of the remaining variables at station SK05HG0283 and for 5 variables, Dissolved Carbon, Hardness Total CaCO3,

Total Kjeldahl Nitrogen, Total Phosphorous and pH. Water quality variable that showed a significant trend were de-trended before autocorrelation analysis as well as for the sampling frequency assessment.

Table 4: Mann-Kendall trend test results for station SK05HG0283.

Water Quality Variables	**Z**	**p-value**
Alkalinity Total CaCO3	1.6931	0.0904
Bicarbonate	1.2684	0.2046
Calcium Dissolved	**2.191**	**0.0285**
Dissolved Carbon Organic	**2.9471**	**0.0032**
Chloride Dissolved	1.8708	0.0614
Fecal Streptococci	-0.1848	0.8534
Hardness Total CaCO3	**2.1525**	**0.0314**
Magnsium Dissolved	1.7724	0.0763
Dissolved NitrogenNitrate	0.7797	0.4355
Total Kjeldahl Nitrogen	**-4.1569**	**0.0000**
Oxygen Dissolved	-1.3566	0.1749
Total Phosphorous	**-2.4543**	**0.0141**
Residue Fixed Non-fiterable (FSS)	-0.7418	0.4582
Residue Non-filterable (TSS)	-0.4257	0.6703
Sodium Dissolved	1.0446	0.2962
Sulphate Dissolved	0.3315	0.7402
Temperature Water	1.3557	0.1752
Turbidity (NTU)	0.1384	0.8899
pH	**2.3095**	**0.0209**

The autocorrelation functions (ACFs) were computed for the variables measured at sampling site SK05HG0283. Figure 2 shows the correlograms for the first 16 lags (monthly basis) for each of the 19 variables measured at SK05HG0283. Figure 3 shows that the autocorrelation was significant in 12 out of the 19 variables. Thus, sampling frequency assessment using the confidence interval approach was applied using the formula proposed by Sanders and Adrian (1978) for the water quality variables that showed no autocorrelation. For water quality variables that showed significant autocorrelation, the formula modified by Loftis and Ward (1979) and simplified by Gilbert (1987) was used.

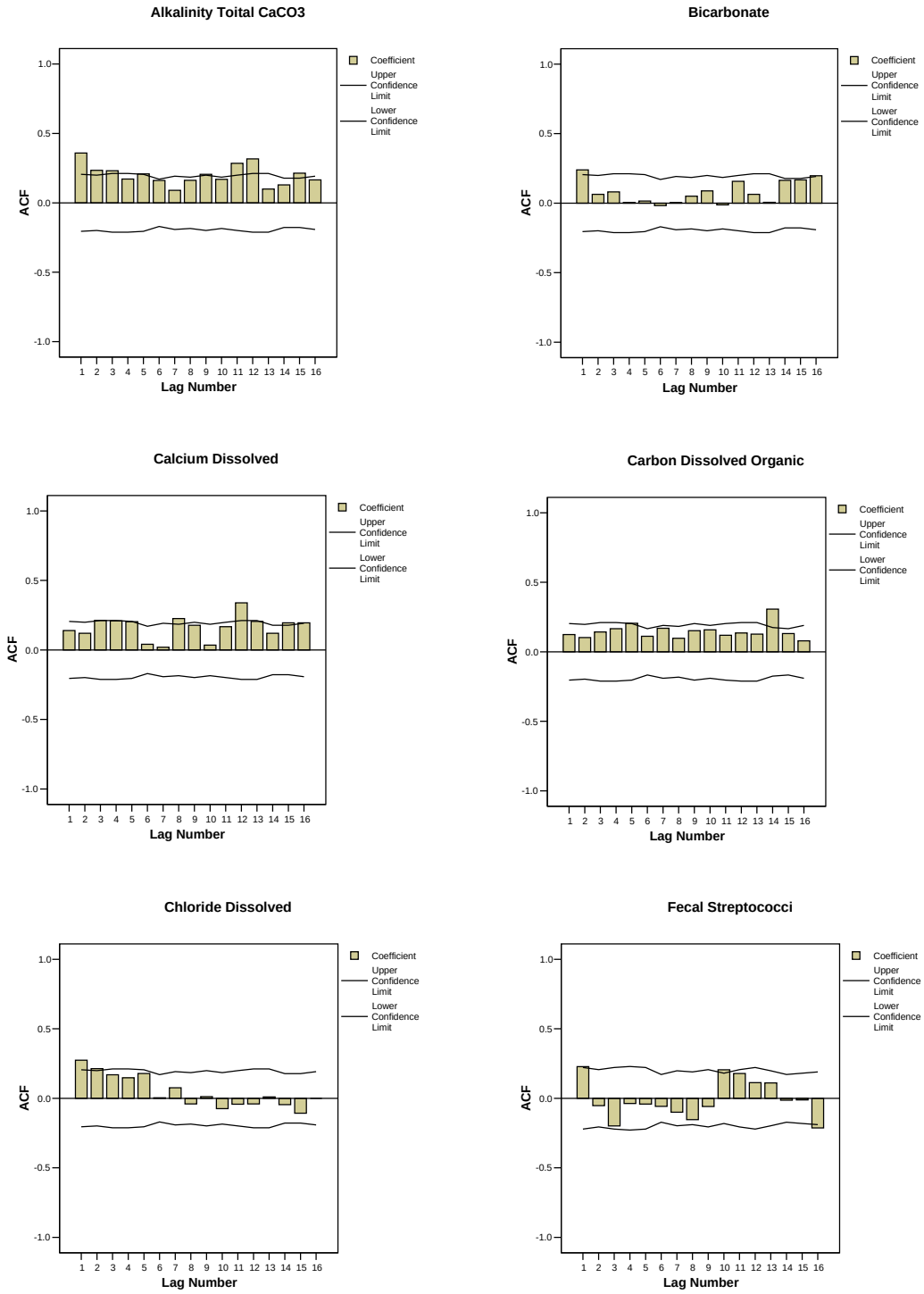

Figure 3. Correlograms for the water quality vairiable measurements at station SK05HG0283.

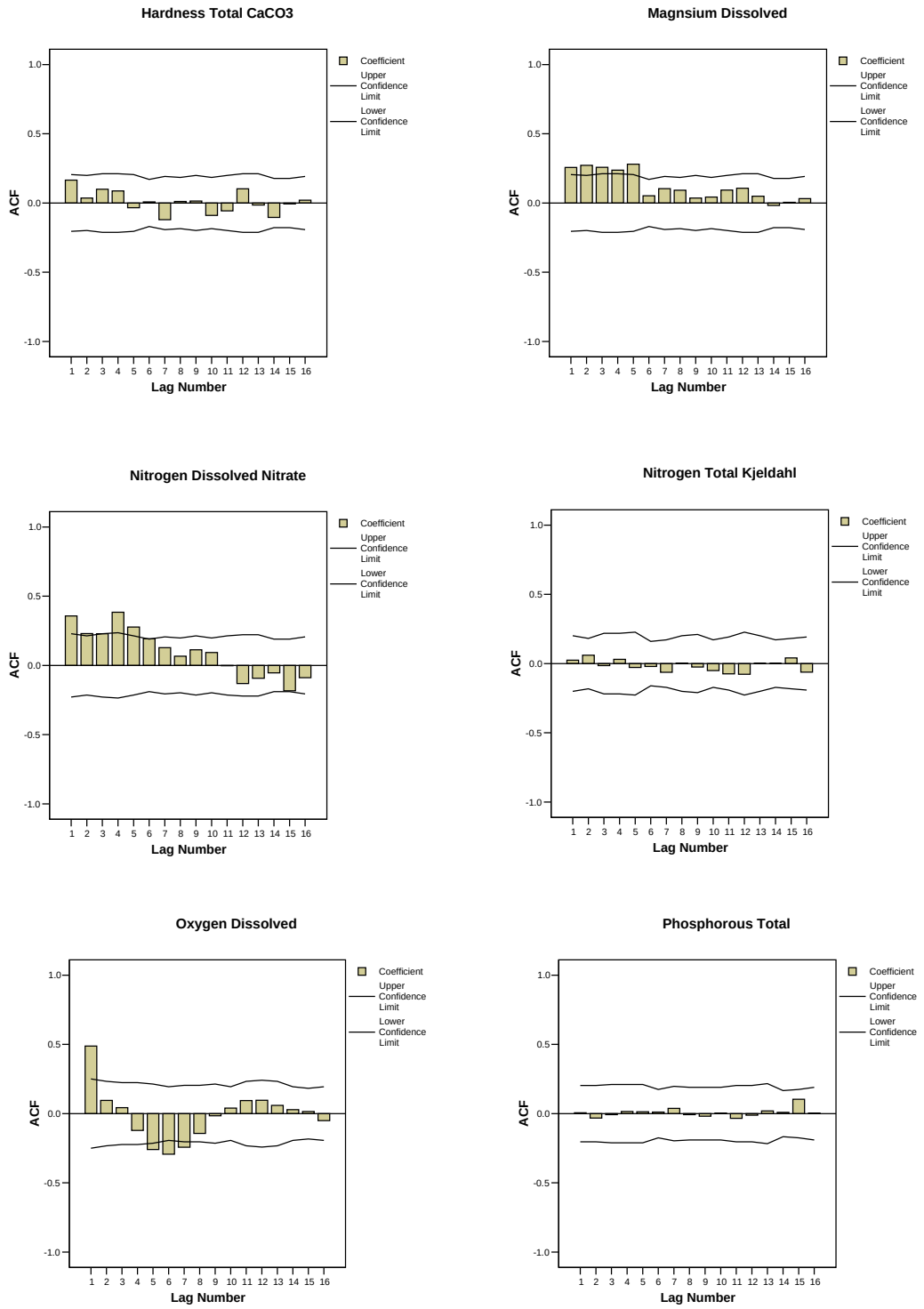

Figure 3. (continued). Collerograms for the water quality variables measurements at SK05HG0283

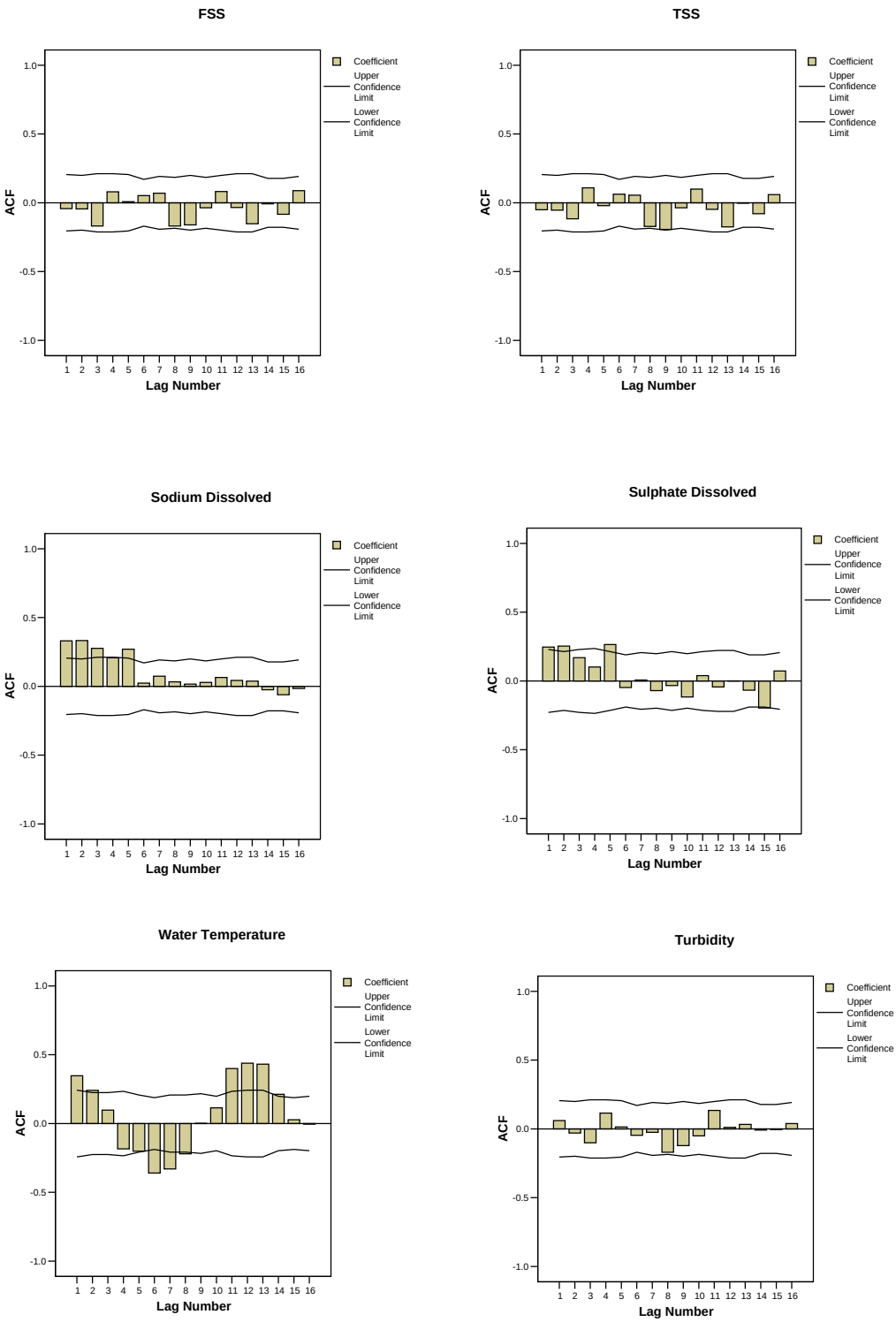

Figure 3. (continued). Collerograms for the water quality variables measurements at SK05HG0283

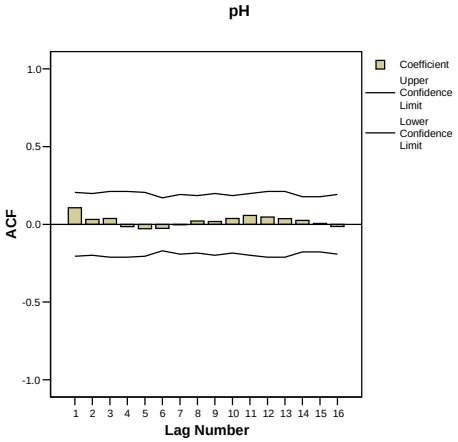

Figure 3. (continued). Collerograms for the water quality variables measurements at SK05HG0283

3.2 Station locations

3.2.1 Principal Component Analysis

Principal components were calculated using the matrix of mean water quality values presented in Table 5. Figure 4 shows the variance explained by each principal component. The first three principal components explain 50%, 15% and 12 % of the variance, respectively.

Loadings are correlations between the original variables and each principal component. Total Alkalinity ($CaCO_3$), Dissolved Organic Carbon, Total Hardness ($CaCO_3$), Magnesium, Potassium and Sodium (Dissolved/Filtered) are the variables that contributed the most to the first PC with loadings of 0.38, 0.32, 0.42, 0.42, 0.43 and 0.39, respectively. For PC2, Water temperature and pH are the variables that contributed the most to explained variance, with values of 0.57 and 0.63, respectively. Finally, the Non-filterable Residue is the main variable defining the third PC, with a loading of 0.73.

Figures 5-7 show the station scores in PC1-PC2, PC1-PC3 and PC2-PC3 space, respectively. Most Environment Canada (EC) stations are distributed along the PC1 gradient, with PC1 scores ranging between -3 and 4 (Figure 5). There are two notable exceptions: station 1 (Churchill River, SAE6EA0003) and station 7 (Carrot River near TurnB, SAO5KH0002) have high negative (<-3) scores on PC2, an indication that the variability in water quality for these two stations is mostly determined by pH and Water Temperature.

Since PC3 explains nearly as much variance as PC2, it was also used to create Cartesian spaces with PC2 (Figure 6) and PC1 (Figure 7). Station 7 (Carrot River near Turn B) has high negative loading on PC2 and PC3, and is isolated from most stations. This is an indication that its water quality properties are quite different than most stations. In contrast, EC stations 5 and 8 are relatively close in all PC spaces.

Station 23 (SK05MC0038) is located in close proximity to EC stations 5 and 8, as shown in Figures 5 to 7 and therefore displays similarities in mean water quality (as defined by the 10 variables in Table 5) as EC stations 5 (Assiniboine River) and 8 (East Poplar River,

SA11AE0008). EC station 4 (Red Deer River, SAO5LC0001) and provincial station 24 (SK06AD0041) are also close in all PC spaces. Their score on PC1 is near zero, while it is approximately -1 on PC2 and 1 on PC3. It is therefore likely that the information content of these two stations (related to the means shown in Table 5) is similar.

EC station 1 is also relatively close to Provincial station 13 (SK06CD0027) in PC1-PC3 space. Provincial stations tend to be more clustered than EC stations, which indicate that they are more similar. For instance, stations 10 (SK05HG0283) and 29 (SK05HH0176) are very close in all three PC spaces, indicating that they provide similar information.

Table 5: Mean values of 10 water quality variables used in the Principal Component analysis

Sampling site	ID	Alkalinity Total $CACO_3$	Dissolved Carbon Organic	Chloride Dissolved	Hardness Total $CACO_3$	Magnesium Dissolved	Potassium Dissolved	Residue Non-filtrable	Sodium Dissolved	Water Temperature	PH
Churchill	1	37.44	6.03	1.33	37.20	3.44	1.07	3.61	3.15	8.28	7.43
Cold R	2	143.89	6.75	0.84	128.33	11.00	1.89	2.30	9.15	6.68	8.31
Qu'Apple R	3	278.45	9.14	74.21	431.04	59.25	16.10	56.60	160.73	8.30	8.16
Red Deer R	4	222.86	16.42	5.17	269.95	27.44	4.77	15.04	15.04	8.43	7.97
Assiniboine R	5	320.18	14.80	24.20	458.26	54.12	11.38	21.95	45.66	8.32	7.96
Battle R	6	366.83	12.83	22.76	268.87	30.50	8.45	65.19	123.08	8.05	8.11
Carrot R	7	248.74	14.29	240.04	313.00	28.45	8.03	43.25	154.92	7.83	7.62
East Poplar R	8	506.34	7.29	6.53	353.23	49.36	9.38	11.70	203.50	9.23	8.00
SK05HF0206	9	168.06	3.99	8.05	182.95	16.97	2.68	10.70	24.79	8.96	8.29
SK05HG0283	10	157.77	4.58	8.03	188.53	17.24	3.00	11.18	23.82	10.15	8.33
SK05FF0020	11	348.25	13.40	30.04	283.17	32.18	9.23	39.38	127.79	11.90	8.38
SK06AG0022	12	182.88	14.24	3.74	164.37	16.57	3.07	10.27	13.66	8.84	7.99
SK06CD0027	13	71.06	8.94	2.53	65.97	6.42	1.63	3.70	6.00	11.43	7.79
SK05GD0076	14	147.43	4.16	5.18	183.86	15.73	1.69	51.47	12.49	10.64	8.32
SK05GG0102	15	155.96	7.24	15.81	189.77	16.98	2.51	74.06	20.54	10.32	8.09
SK05GG0022	16	152.27	5.22	7.62	189.03	16.52	2.19	63.21	14.46	10.69	8.16
SK05EG0090	17	143.64	4.35	6.19	179.29	15.17	1.73	44.11	11.97	9.89	8.16
SK05JG0126	18	168.29	5.35	11.37	196.29	19.63	3.66	15.78	35.61	9.14	8.26
SK05HH0267	19	157.44	4.24	7.98	189.45	17.81	3.06	22.78	23.21	9.24	8.20
SK05HF0205	20	155.28	3.95	6.68	186.08	17.82	2.95	12.96	21.23	8.04	8.24
SK05KD0154	21	152.92	5.19	9.01	193.61	20.38	3.17	73.90	19.75	9.69	8.13
SK05KD0089	22	153.03	5.60	9.55	181.88	16.06	2.44	4.69	17.74	9.72	8.16
SK05MC0038	23	294.13	18.16	22.56	430.86	52.43	12.25	29.33	39.28	8.44	8.14
SK06AD0041	24	217.53	16.52	3.92	201.17	20.45	3.07	19.91	17.54	8.79	8.02
SK05GG0023	25	151.09	5.01	7.81	184.07	15.94	2.16	56.57	14.37	10.33	8.17
SK05JL0129	26	245.96	15.43	85.16	411.24	60.45	17.93	9.28	185.90	10.16	8.59
SK05JF0092	27	195.04	8.19	36.71	227.90	26.18	6.30	69.67	61.44	9.66	8.23
SK05HB0087	29	154.05	4.84	7.86	186.02	17.09	3.25	120.91	19.68	10.28	8.18
SK05HH0176	29	158.15	4.49	8.26	190.85	18.32	2.89	13.43	24.62	10.65	8.28
SK05NB0198	30	370.68	22.60	50.40	342.45	44.52	14.03	22.20	244.71	10.53	8.18

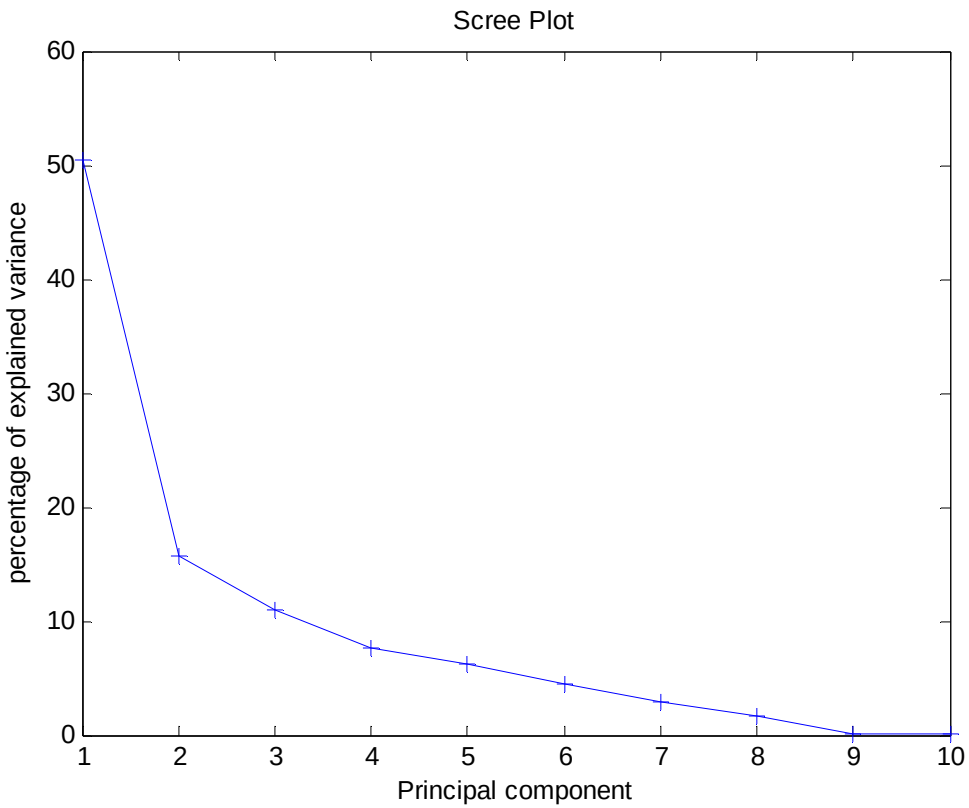

Figure 4. Variance explained by each Principal Component.

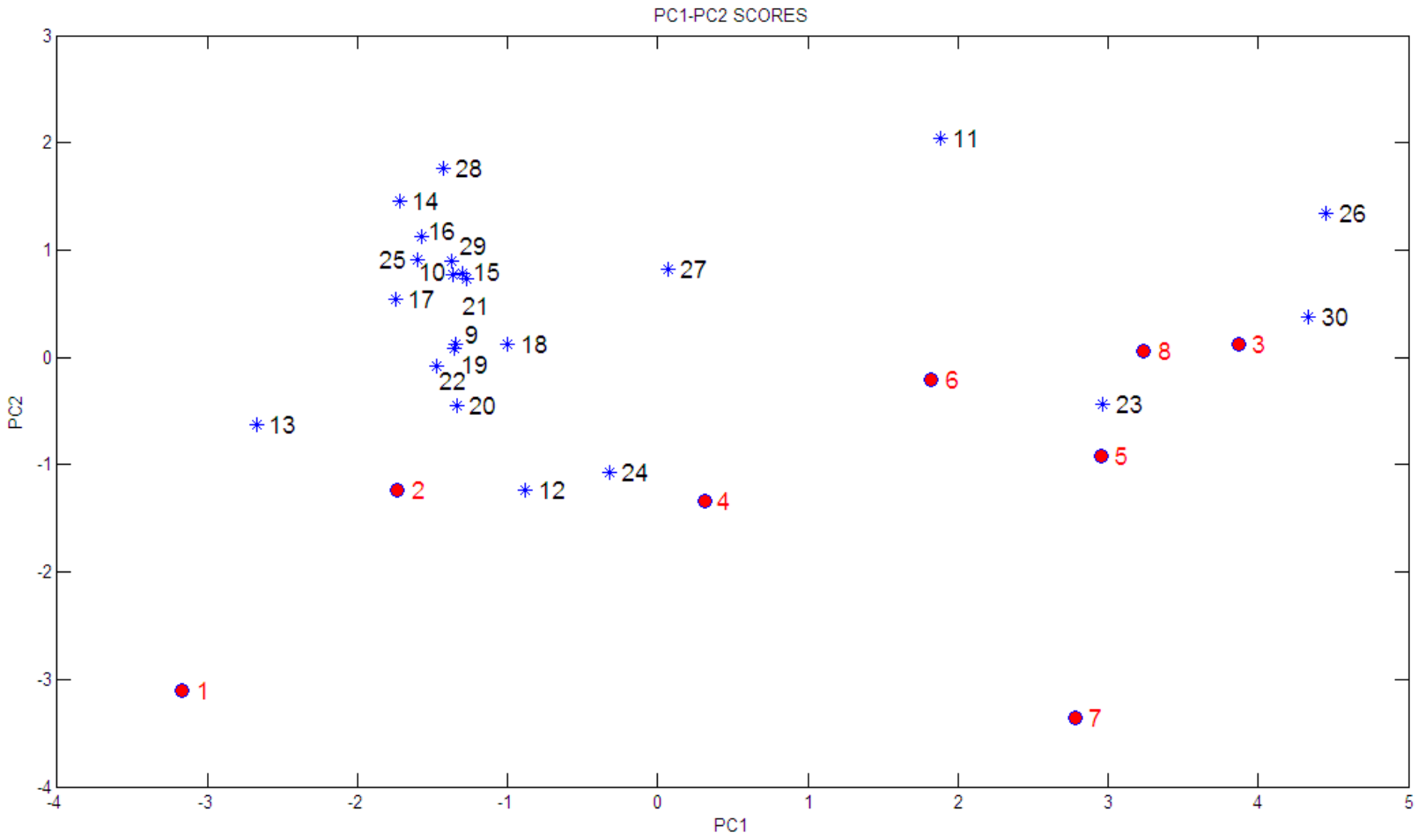

Figure 5. Station scores in PC1-PC2 space. Red dots indicate Environment Canada stations.

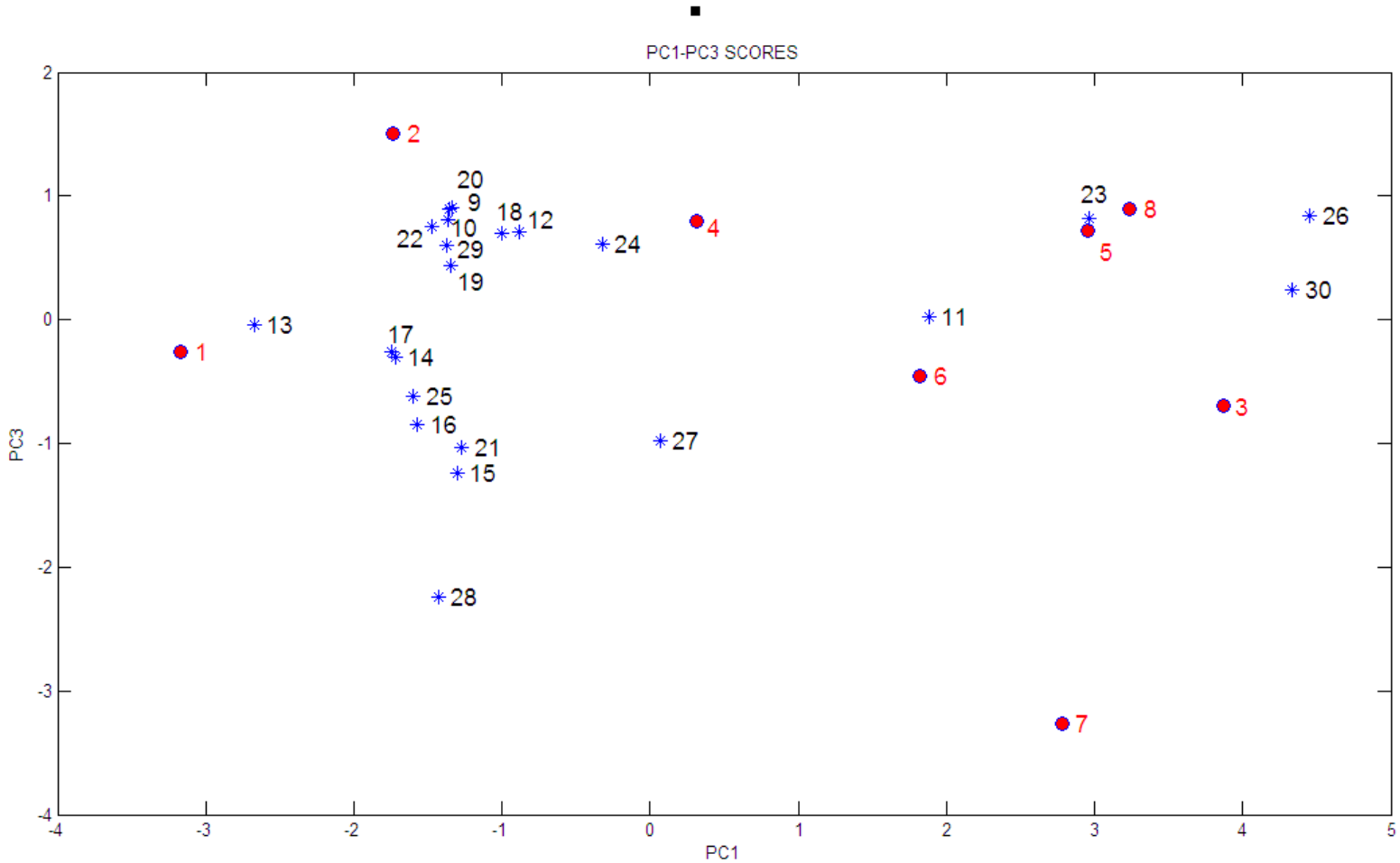

Figure 6. Station scores in PC1-PC3 space. Red dots indicate Environment Canada stations.

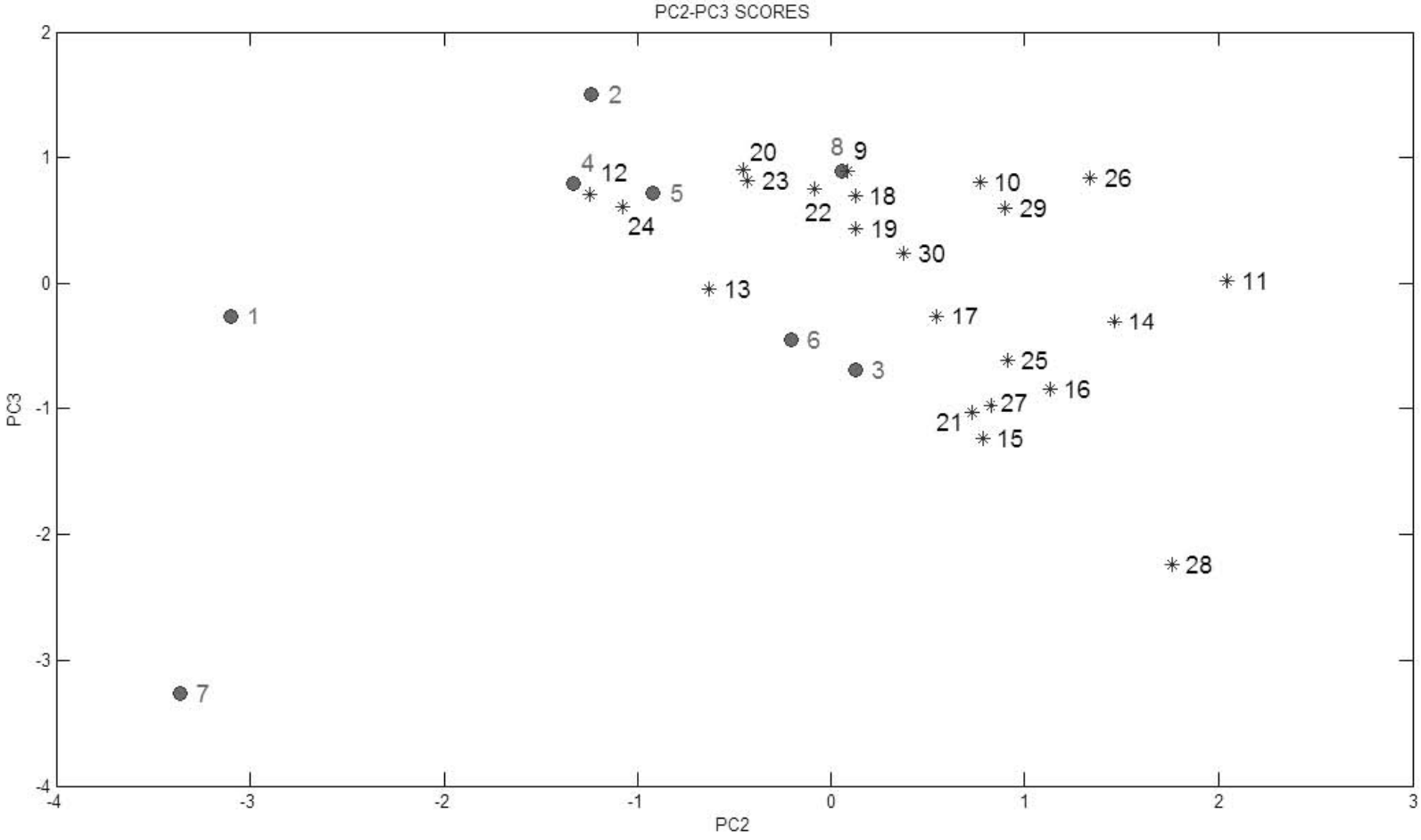

Figure 7. Station scores in PC2-PC3 space. Red dots indicate Environment Canada stations.

3.2.2 Cluster Analysis

Using the means shown in Table 5, a cluster analysis was also performed. Figure 8 shows the dendogram, which is a depiction of the various clusters associated with different linkage distance values. It can be seen that for a linkage distance > 1000 all stations are within the same cluster. When the linkage distance is set at 50, 15 clusters can be identified. At that linkage level, some stations form individual clusters, which means that they stand alone are excluded from larger clusters. They should likely be prioritized in the network because of their dissimilarity with other stations. The list includes five federal stations and 5 provincial stations:

- 2 (Cold River (SAE06AF0001))
- 3 (Qu'Appelle River (SA05JM0014))
- 4 (Red Deer River (SAO5LC0001))
- 7 (Carrot River near TurnB (SAO5KH0002))
- 8 (East Poplar River (SA11AE0008))
- 24 (SK06AD0041)
- 26 (SK05JL0129)
- 27 (SK05JF0092)
- 28 (SK05HB0087)
- 30 (SK05NB0198)

Clusters that comprise only two stations include the following pairs:

- 6 (Battle River) –11 (SK05FF0020)
- 5 (Assiniboine River)-23 (SK05MC0038)
- 1 (Churchill River, SAE6EA0003) -13 (SK06CD0027)

It should be noted that each of these three pairs include one federal station and one provincial station. The fact that they are in the same cluster indicated a certain similarity in water quality information. Finally, two large clusters include all the other stations, indicating some potential redundancy. If stations should be removed from the network, they should likely be selected from these clusters.

The first large cluster includes the following eight stations:

- 9 (SK05HF0206)
- 10 (SKO5HG0283)

- 12 (SK06AG0022)
- 18 (SK05JG0126)
- 19 (SK05HH0267)
- 20 (SK05HF0205)
- 22 (SK05KD0089)
- 29 (SK05HB0127)

The second cluster includes six stations:

- 14 (SK05GD0076)
- 15 (SK05GG0102)
- 16 (SK05GG0022)
- 17 (SK05EG0090)
- 21 (SK05KD0154)
- 25 (SK05GG0023)

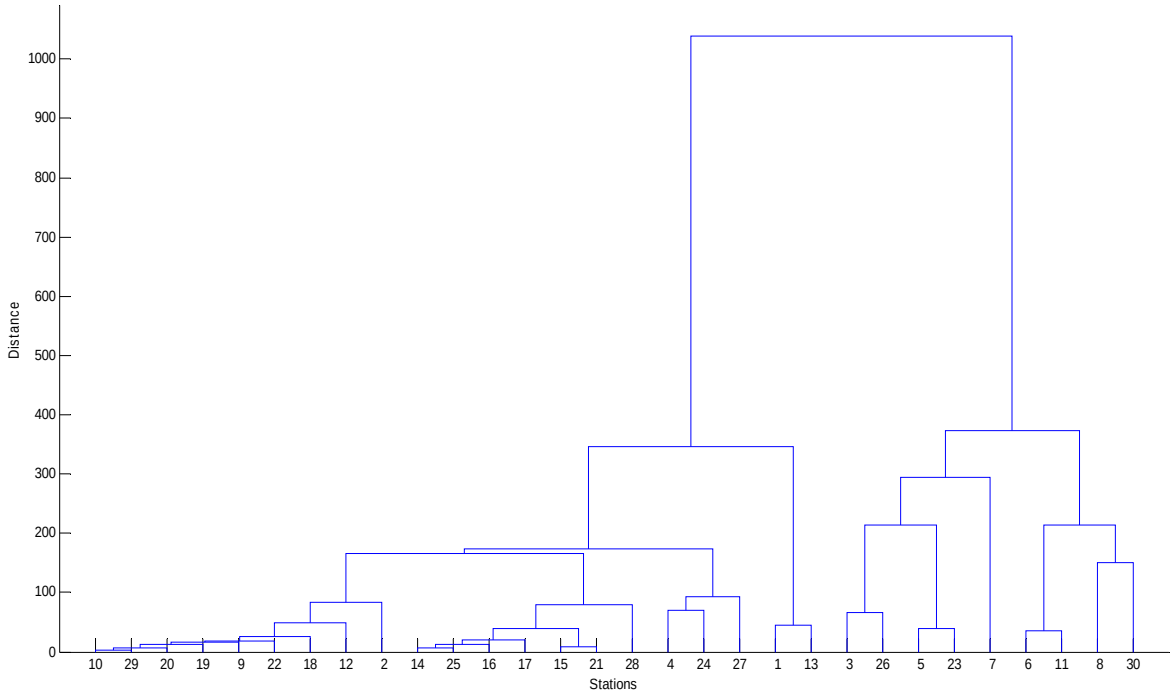

Figure 8. Dendogram showing cluster analysis results.

For the assessment of the optimal combination of locations to discontinue, the three variables with the highest PC1 loading were selected, since these variables are the main source of variability among sampling sites. The three variables considered are Total Alkalinity, Total Hardness and Dissolved Sodium.

It should be emphasized that, the final rationalized list of sites should ideally contain sites from all identified clusters. If all sites of a particular cluster are discontinued, it will no longer be possible to extend data using measurements from other sites within that cluster. Thus, single-site clusters should be continuously measured. Only five multiple-site clusters are considered in this assessment as follows:

- First cluster includes 6 MOE sites (maximum number of sites to discontinue is 5);
- Second cluster includes 8 MOE sites (maximum number of sites to discontinue is 7);
- Each of the remaining three clusters includes only one MOE site and one EC site, (one site to be discontinued from each cluster).

Thus, the maximum possible number of sites that could be discontinued is 15. In the case where only one sampling site to be discontinued, the I_a is computed assuming each site to be discontinued. Table 6 shows the I_a associated with each site in ascending order. In the case where two sites are to be discontinued from the five multiple-site clusters (17 MOE sites), the possible combinations of two sites to discontinue is C(17,2) = 136. Table 7 shows the first 17 combinations of two sites to be discontinued and the I_a associated with each combination. Similarly, Appendix (I) shows the possible combinations of 3 to 15 sites to discontinue.

Table 6. Combinations of sites to discontinue

One site to discontinue	I_a	*Two sites to discontinue*		I_a
11	403.00	11	16	394.02
16	466.49	11	14	400.00
14	472.46	11	21	400.02
21	472.49	23	11	400.66
23	473.12	11	12	401.24
12	473.71	11	18	401.45
18	473.91	11	25	401.48
25	473.95	11	15	401.61
15	474.08	11	17	401.96
17	474.42	11	22	402.35
22	474.81	11	9	402.46
9	474.92	11	10	402.47
10	474.94	11	29	402.54
29	475.00	11	19	402.80
19	475.27	11	20	402.95
20	475.41	13	11	403.00
13	475.47	14	16	463.49

3.3 Water quality variables

This section discusses the results obtained from the application of the approach to rationalize water quality variables measured at the Saskatchewan water quality monitoring network. The approach is applied to each of the sampling sites separately. Results obtained from the application of the rationalization approach to sampling site SK05HG0283 are presented in this section. Detailed results for each of the MOE sampling sites are presented in Appendix G.

Using cluster analysis (CA), correlation analysis and the criteria developed for the identification of the correlation coefficient thresholds (d_m and d_v) (Equations B8 and B9, Appendix B), groups of highly correlated water quality variables were identified. Figure 9 shows the cluster tree for water quality variables measured at sampling site SK05HG0283, where the x-axis indicates the code of the water quality variables and the y-axis indicates the linkage distance between clusters. Results show that $d_m = 0.75$ and $d_v = 0.34$. The lowest criterion from d_m and d_v was applied, thus, the d_v criterion was applied as indicated by the horizontal line at a cut-off distance of 0.34 (Figure 9).

Using d_v value as a correlation coefficient threshold, the water quality variables were divided into 14 clusters, 10 of which were single-variable clusters. These 10 variables should be continuously monitored because the information they provide cannot be estimated from other variables. Figures representing the CA for each of the sampling sites are presented in Appendix G. Four other clusters were considered for further analysis. FSS and TSS form the first cluster. The second cluster consisted of Alkalinity Total $CaCO_3$, Calcium Dissolved and Hardness Total $CaCO_3$. Third cluster consisted of Sodium Dissolved and Sulphate Dissolved. The fourth cluster consists of Oxygen Dissolved and Water Temperature. At least one variable from each of these four clusters should be continuously measured. Given that the four clusters contained nine water quality variables, the maximum number of variables to discontinue would be five. Similarly, for sampling site SK05HF0205, the maximum number of variables to discontinue is five. However, it reaches 15 variables to discontinue at sampling site SK05JF0092, where 12 clusters were obtained.

Within each multiple-variable cluster, each variable was assumed to be discontinued, and its best auxiliary variable was identified based on Equation C4 (Appendix C). Three out of the four clusters, each consisted of only two variables. In this case, each variable was an auxiliary for the other variable, and only one variable could be discontinued from each of these clusters. The second cluster consisted of thee variables. Therefore, each variable was considered discontinued, and Equation C4 (Appendix C) was applied to identify the best auxiliary from the other two variables in the same cluster.

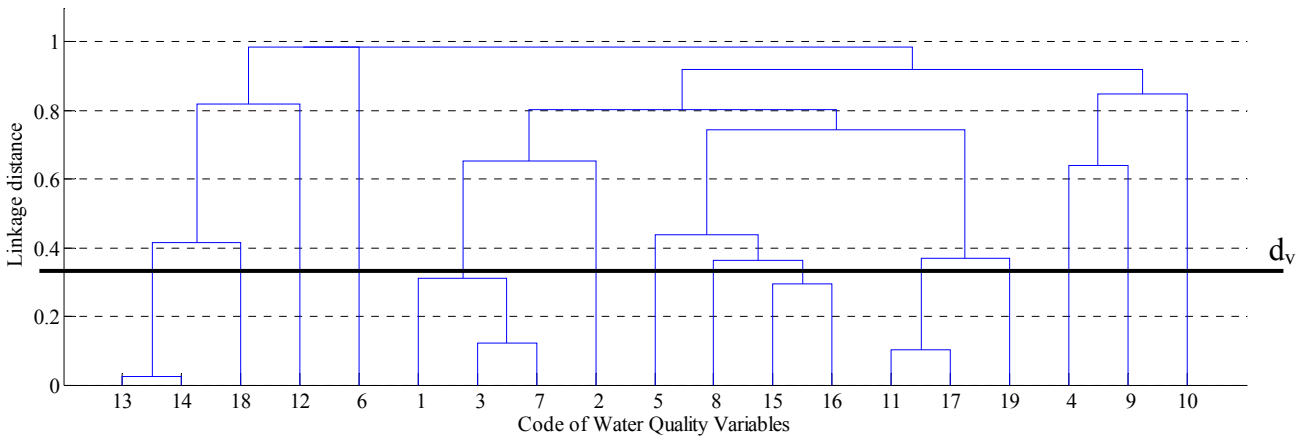

***Figure 9**. Cluster tree for water quality variables at SK05HG0283*

Using Equation B2, Calcium Dissolved was found to be the best auxiliary for Total Hardness CaCO3, while Hardness Total CaCO3 is the best auxiliary for Calcium Dissolved and Alkalinity Total CaCO3. Table 7 shows all of the alternatives; assuming each variable was discontinued (first column), the best auxiliary variable was identified (second column). The correlation between the discontinued variable and its best auxiliary, the number of available observations, the estimated variance after n_2 years obtained from the application of Equation B2, and the aggregate Information index are presented in the remaining columns, respectively.

If one variable is to be discontinued from the list of variables being measured at this site, the aggregated information index is applied (Equation C10). The variables listed in Table 7 are ranked based on the information index (sixth column). If only one variable is to be discontinued, from a statistical point of view it can be Dissolved Sulphate. Table 7 provides the rank of the variables to be discontinued from a statistical point of view. Thus, it can be used along with other

criteria to choose which variable to discontinue. Other criteria may include stakeholders' preference, the significance of the variable in specific studies or laboratory costs. Tables showing variables to be discontinued and its best auxiliary variables for the MOE selected sampling sites are presented in Appendix G.

Table 7. Variable to discontinue and its best auxiliary variable

Discontinued variable	**Best auxiliary variable**	***r***	**Number of samples**	$Var(\hat{\mu})$	I_a
Sulphate Dissolved	Sodium Dissolved	0.840	34	-0.0078	2.474
Sodium Dissolved	Sulphate Dissolved	0.840	34	-0.0078	2.482
Oxygen Dissolved	Water Temperature	-0.947	28	0.2206	2.930
Water Temperature	Oxygen Dissolved	-0.947	28	0.2206	2.937
TSS	FSS	0.987	38	0.2156	2.946
FSS	TSS	0.987	38	0.2156	2.946
Calcium Dissolved	Hardness Total CaCO3	0.938	38	0.2969	3.027
Hardness Total CaCO3	Calcium Dissolved	0.938	38	0.2969	3.027
Alkalinity Total CaCO3	Hardness Total CaCO3	0.836	38	0.4515	3.154

When more than one variable are to be discontinued, the information index was applied to rank the different combinations. For example, if two water quality variables must be discontinued, $C(9,2)=36$ different combinations may be considered. Table 8 shows the first 15 combinations ranked based on the information index for the cases of two variables to be discontinued, three variables to be discontinued (Table 9), four variables to be discontinued (Table 10) and five variables to be discontinued (Table 11). For the MOE sampling sites, cluster analysis indicated that the levels of correlation between water quality variables varied from site to site. Consequently, groups of highly associated variables also varied. Detailed results for each of the MOE sampling sites are presented in Appendix G, where possible variables to discontinue from each sampling site are presented with their best auxiliary variables.

Table 8. Combinations of two variables to discontinue

Two variables		I_a %
Sulphate Dissolved	Oxygen Dissolved	2.133
Sulphate Dissolved	Water Temperature	2.142
Sodium Dissolved	Oxygen Dissolved	2.142
Sodium Dissolved	Water Temperature	2.151
Sulphate Dissolved	FSS	2.154
Sulphate Dissolved	TSS	2.154
Sodium Dissolved	FSS	2.163
Sodium Dissolved	TSS	2.163
Sulphate Dissolved	Calcium Dissolved	2.235
Sulphate Dissolved	Hardness Total CaCO3	2.235
Sodium Dissolved	Hardness Total CaCO3	2.244
Sodium Dissolved	Calcium Dissolved	2.244
FSS	Oxygen Dissolved	2.365
TSS	Oxygen Dissolved	2.365
FSS	Water Temperature	2.374

Table 9. Combinations of three variables to discontinue

Three variables to be discontinued			I_a %
Sulphate Dissolved	FSS	Oxygen Dissolved	2.02
Sulphate Dissolved	TSS	Oxygen Dissolved	2.02
Sulphate Dissolved	FSS	Water Temperature	2.03
Sulphate Dissolved	TSS	Water Temperature	2.03
Sodium Dissolved	FSS	Oxygen Dissolved	2.03
Sodium Dissolved	TSS	Oxygen Dissolved	2.03
Sodium Dissolved	FSS	Water Temperature	2.04
Sodium Dissolved	TSS	Water Temperature	2.04
Sulphate Dissolved	Oxygen Dissolved	Hardness Total CaCO3	2.10
Sulphate Dissolved	Oxygen Dissolved	Calcium Dissolved	2.10
Sulphate Dissolved	Water Temperature	Hardness Total CaCO3	2.11
Sulphate Dissolved	Water Temperature	Calcium Dissolved	2.11
Sodium Dissolved	Oxygen Dissolved	Calcium Dissolved	2.11
Sodium Dissolved	Oxygen Dissolved	Hardness Total CaCO3	2.11
Sodium Dissolved	Water Temperature	Calcium Dissolved	2.12

Table 10. Combinations of four variables to discontinue

Four variables to discontinue				I_a %
Sulphate Dissolved	FSS	Oxygen Dissolved	Calcium Dissolved	1.986
Sulphate Dissolved	TSS	Oxygen Dissolved	Calcium Dissolved	1.986
Sulphate Dissolved	FSS	Oxygen Dissolved	Hardness Total CaCO3	1.986
Sulphate Dissolved	TSS	Oxygen Dissolved	Hardness Total CaCO3	1.986
Sulphate Dissolved	FSS	Water Temperature	Calcium Dissolved	1.995
Sulphate Dissolved	TSS	Water Temperature	Calcium Dissolved	1.995
Sulphate Dissolved	FSS	Water Temperature	Hardness Total CaCO3	1.995
Sulphate Dissolved	TSS	Water Temperature	Hardness Total CaCO3	1.995
Sodium Dissolved	FSS	Oxygen Dissolved	Calcium Dissolved	1.995
Sodium Dissolved	TSS	Oxygen Dissolved	Calcium Dissolved	1.995
Sodium Dissolved	FSS	Oxygen Dissolved	Hardness Total CaCO3	1.995
Sodium Dissolved	TSS	Oxygen Dissolved	Hardness Total CaCO3	1.995
Sodium Dissolved	FSS	Water Temperature	Calcium Dissolved	2.004
Sodium Dissolved	TSS	Water Temperature	Calcium Dissolved	2.004
Sodium Dissolved	FSS	Water Temperature	Hardness Total CaCO3	2.004

Table 11. Combinations of five variables to discontinue

Five variables to discontinue					I_a %
Sulphate Dissolved	FSS	Oxygen Dissolved	Calcium Dissolved	Alkalinity Total CaCO3	2.108
Sulphate Dissolved	TSS	Oxygen Dissolved	Calcium Dissolved	Alkalinity Total CaCO3	2.108
Sulphate Dissolved	FSS	Water Temperature	Calcium Dissolved	Alkalinity Total CaCO3	2.117
Sulphate Dissolved	TSS	Water Temperature	Calcium Dissolved	Alkalinity Total CaCO3	2.117
Sodium Dissolved	FSS	Oxygen Dissolved	Calcium Dissolved	Alkalinity Total CaCO3	2.117
Sodium Dissolved	TSS	Oxygen Dissolved	Calcium Dissolved	Alkalinity Total CaCO3	2.117
Sodium Dissolved	FSS	Water Temperature	Calcium Dissolved	Alkalinity Total CaCO3	2.126
Sodium Dissolved	TSS	Water Temperature	Calcium Dissolved	Alkalinity Total CaCO3	2.126

Based on detailed analysis, the following groups of water quality variables are highly correlated at most of the MOE sampling sites:

- Total Dissolved Solids, Specific Conductance, Conductance (field), cations and anions;
- Residue fixed nonfilterable, residue nonfilterable, residue volatile nonfiltrable and Turbidity;
- Coliforms Fecal, Coliforms Total, and Fecal Streptococci;
- Alkalinity phenolphthalein CaCo3, Alkalinity Total CaCO3, Carbonate, Bicarbonate, Hardness Total CaCO3;
- Air Temperature and Water Temperature.

The proposed approach provides the decision maker with the optimal combinations of variables to discontinue from a statistical point of view. Various criteria could be integrated when making a final decision. Such criteria may include the the existence of a water quality standard for the selected variables, the fact that the selected variables are used to compute water quality index, significance for particular studies, or laboratory analyses costs.

The same approach was applied for EC water quality monitoring network. The objective was to identify if some of the variables measured only through the EC monitoring network should be added to the list of variables measured by the MOE network. A comparison of the set of water quality variables measured at EC sampling sites and that measured at MOE sites was carried. The comparison was carried out between EC sampling sites and the nearest MOE sampling site, where it is assumed that each pair of EC and MOE sites are sampling the same catchment, as shown in Table 12.

Table 12. Pairs of locations considered for water quality variables comparison

EC Sampling site	MOE sampling site	remarks
Churchill River (SA06EA0003)	Churchill River (SK06CD0027)	Similarity confirmed by sampling location assessment
Qu'Apple River (SA05JM0014)	Qu'Apple River (SK05JL0129)	The same river and within the same waterhsed
Battle River (SA05FE0001)	Battle River (SK05FF0020)	Similarity confirmed by sampling location assessment
Assiniboine River (SA05MD0002)	Assiniboine River (SK05MC0038)	Similarity confirmed by sampling location assessment

The comparison was carried out in two steps. The first step was to identify water quality variables that are measured by the EC monitoring network and not considered by the MOE network. In the

second step, the water quality variables rationalization approach was applied. The extra EC variables were then assessed relative to other variables within each of the considered EC sampling sites separately. If one of the extra variables is highly correlated with one of the variables measured by the MOE network, it indicates that there is information redundancy and therefore there is no need to add this variable to the MOE network. If the extra variable is not highly correlated with one of the variables measured by the MOE network, it indicates that this variable may have a unique type of information and therefore be added to the list of variables measured by the MOE.

Variables that are measured by the EC network and not the MOE network for the five paired stations under comparison are summarized in Table 13. For the Churchill River sampling sites, only Lithium is considered as an extra variable. Based on the results obtained from applying the water quality variables rationalization approach, Lithium is highly correlated with variables measured by the MOE network (e.g. Alkalinity Total CaCO3, Bicarbonate and other variables) as shown in the cluster tree presented for the Churchill River sampling site (SA06EA0003) (Appendix G). Hence, Lithium is not considered to be added to the list of variables measured at Churchill River (SK06CD0027). Similarly, there are five variables (Table 13) that are measured at the fedral Qu'Appelle River station (SA05JM0014) but not at the provincial Qu'Appelle River station (SK05JL0129). These five variables are highly correlated with other variables that are of the same type as those measured at Qu'Appelle River (SK05JL0129) (see cluster tree for SA05JM0014, (Appendix G). Thus, none of these variables was considered to be added to the list of variables measured at SK05JL0129.

Seven variables were considered extra for the Battle River sampling sites. Five of these seven variables were highly correlated and the other two were considered for possible addition to the list of variables measured at the Battle River (SK05FF0020) sampling site. Similarly, seven variables were considered as possible variables to be added to the list of variables measured at Assiniboine River (SK05MC0038) sampling site (Table 13).

Table 13. Water quality variables proposed to be measured at MOE sites

EC Sampling site	MOE sampling site	Extra variables	Variables may be added to MOE network
Churchill River (SA06EA0003)	Churchill River (SK06CD0027)	Lithium	---------
Qu'Appelle River (SA05JM0014)	Qu'Appelle River (SK05JL0129)	Bismuth Gallium Lanthanum Lithium Rubidium	---------
Battle River (SA05FE0001)	Battle River (SK05FF0020)	1,2,4,5-Tetrabromobenzene Bismuth Delta-Benzenehexachloride Gallium Lanthanum Lithium Rubidium	Delta-Benzenehexachloride Lithium
Assiniboine River (SA05MD0002)	Assiniboine River (SK05MC0038)	1,2,4,5-Tetrabromobenzene 2,3-D Bismuth Clopyralid Delta-Benzenehexachloride Endrin Gallium Gamma-Benzenehexachloride Lithium Rubidium	1,2,4,5-Tetrabromobenzene 2,3-D Clopyralid Delta-Benzenehexachloride Endrin Gamma-Benzenehexachloride Lithium

3.4 Sampling frequency

The approach described in section 2.2.1 and Appendix D (confidence interval around the mean) was used to estimate the sampling frequency of various water quality variables, given an acceptable error and confidence interval. Detailed results for the MOE sampling sites are presented in Appendix H. Results obtained for sampling site SK05HG0283 are shown in this section, as an example.

Since estimation of the variance of the stationary component requires removing the trend, water quality variables that exhibited a significant trend were de-trended before applying the confidence interval approach.

As described in Appendix D, half of the confidence interval was considered as the error in estimating the population mean. In this study, several error percentages were considered, ranging from 10% to 60% of the sample mean. In addition, three significant levels were considered: 95%, 90% and 80%. The error percentages are then plotted against the number of samples obtained for each of the significant levels.

Figure 10 shows the number of samples required to estimate Dissolved Chloride mean value at sampling site SK05HG0283 for the three significant levels considered. Figure 10 shows that for the range of the small error percentages (10% < E < 35%), dramatic reduction in the number of samples resulted in only a minor increase in the error. For the larger error percentages (E > 40%), slight reduction in the number of samples resulted in a large increase in the expected error. For example, in the case of the 95% confidence interval, reducing the number of samples from 18 to 9 increased the expected error of the estimated Chloride Dissolved mean value from 10% to 15%. In contrast, when the number of samples was reduced from 4 to 3, the expected error increased from 30 to 50%.

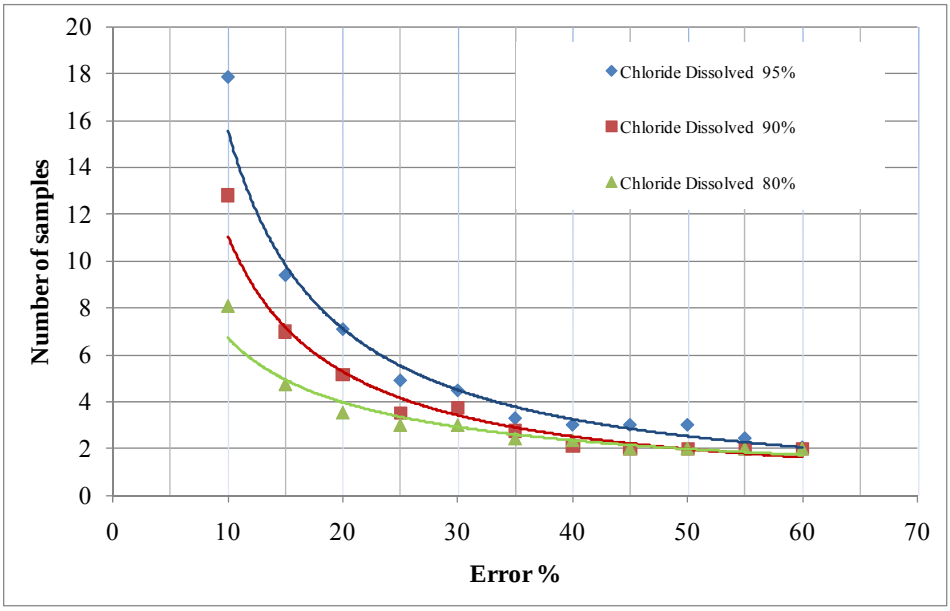

Figure 10. Number of samples vs. expected error for the Dissolved Chloride measured at sampling site SK05HG0283.

In addition, Figure 10 shows the effect of the confidence level on the number of samples required. In the range of low-error percentages, the number of samples increased dramatically when the confidence level increased. For example, when the confidence level increased from 80% to 90%, the number of samples increased from 8 to 13 for 10% expected error; for the 95% confidence level, the required number of samples was 18. However, in the range of high-error percentages, reducing the number of samples is not that significant. For example, from Figure 10, for 30% expected error, the number of samples required was 3, 4 and 5 for the 80%, 90% and 95% confidence levels, respectively.

Due to the relatively low variation Total Alkalinity CaCO3, Bicarbonate, Calcium Dissolved, Hardness Total CaCO3, Magnesium Dissolved, Sodium Dissolved, Sulphate Dissolved and pH, these variables were not considered in this analysis. Three or four samples per year are recommended for these variables measurements at sampling site SK05HG0283.

Figures 11-20 show the number of samples versus the expected error percentages for Dissolved Organic Carbon, Fecal Streptococci, Dissolved Nitrate, Total Kjeldahl Nitrogen, Dissolved

Oxygen, Total Phosphorous, Fixed Non-filterable Residue, non-filterable Residue, Dissolved Sodium, Water Temperature and Turbidity. From Figures 11-20, the number of samples required to estimate Water Temperature mean value was the largest of all variables, which was due to the relatively high variation in observations. The next largest number of samples was required for Total Phosphorous.

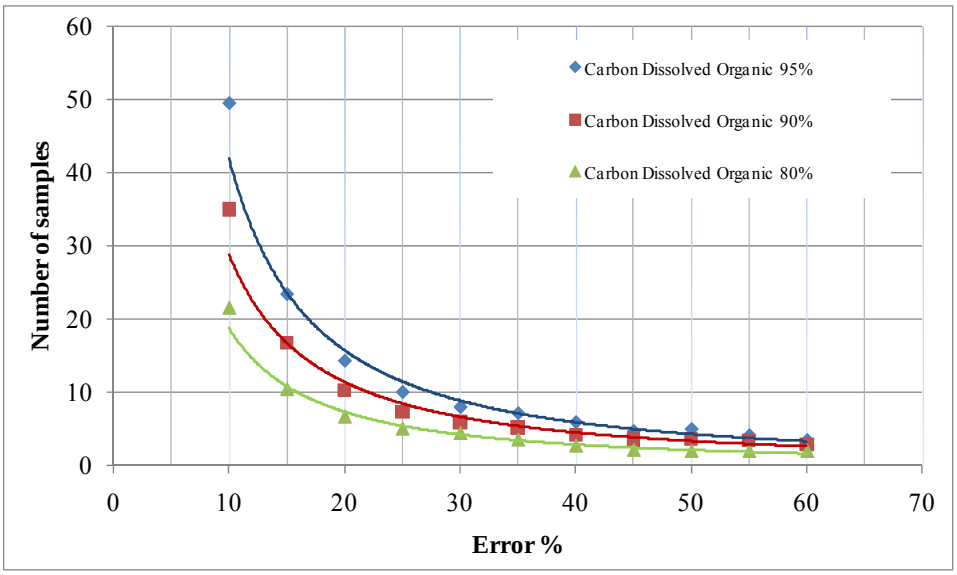

Figure 11. Number of samples vs. expected error for Dissolved Organic Carbon measured at sampling site SK05HG0283.

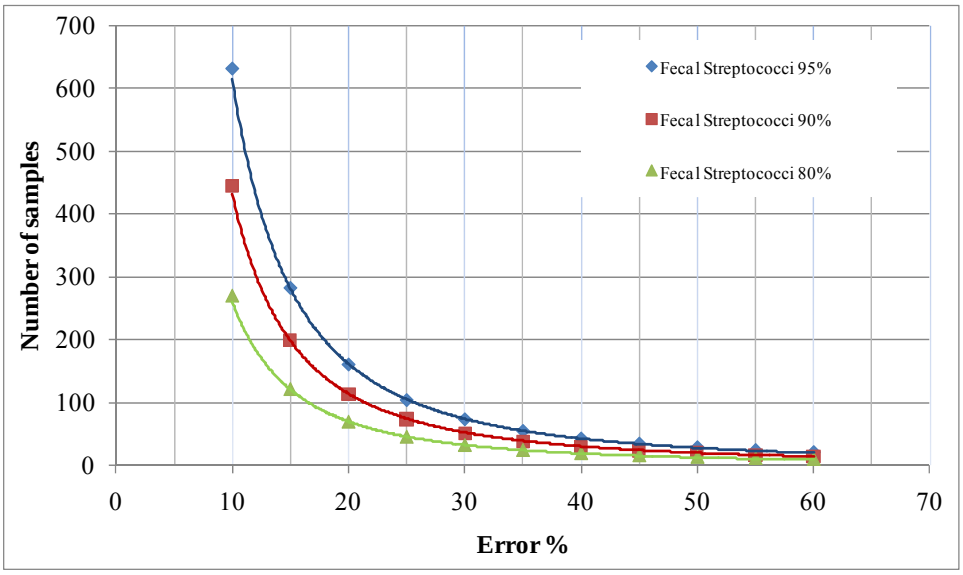

Figure 12. Number of samples vs. expected error for Fecal Streptococci measured at sampling site SK05HG0283.

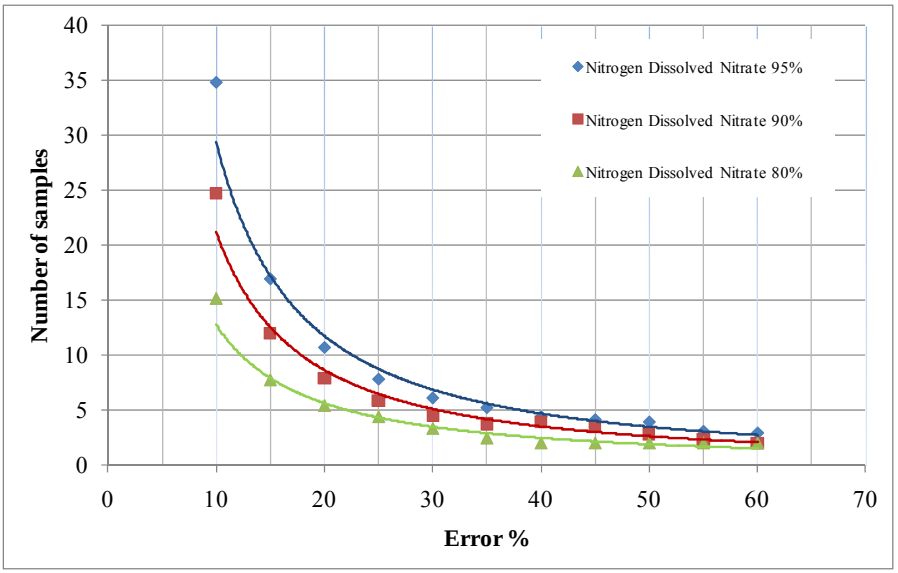

Figure 13. Number of samples vs. expected error for Dissolved Nitrate measured at sampling site SK05HG0283.

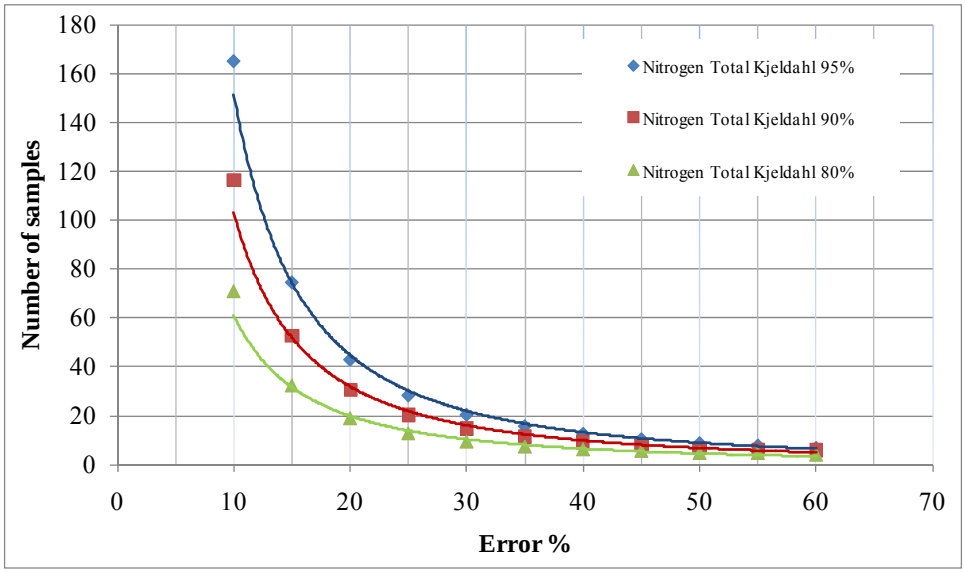

Figure 14. Number of samples vs. expected error for Total Kjeldahl Nitrogen measured at sampling site SK05HG0283.

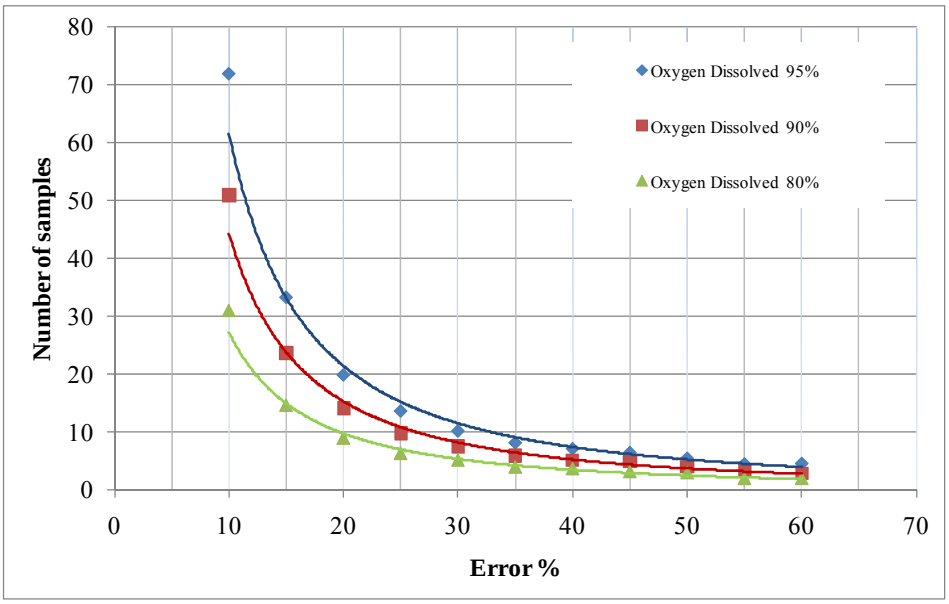

Figure 15. Number of samples vs. expected error for Dissolved Oxygen measured at sampling site SK05HG0283.

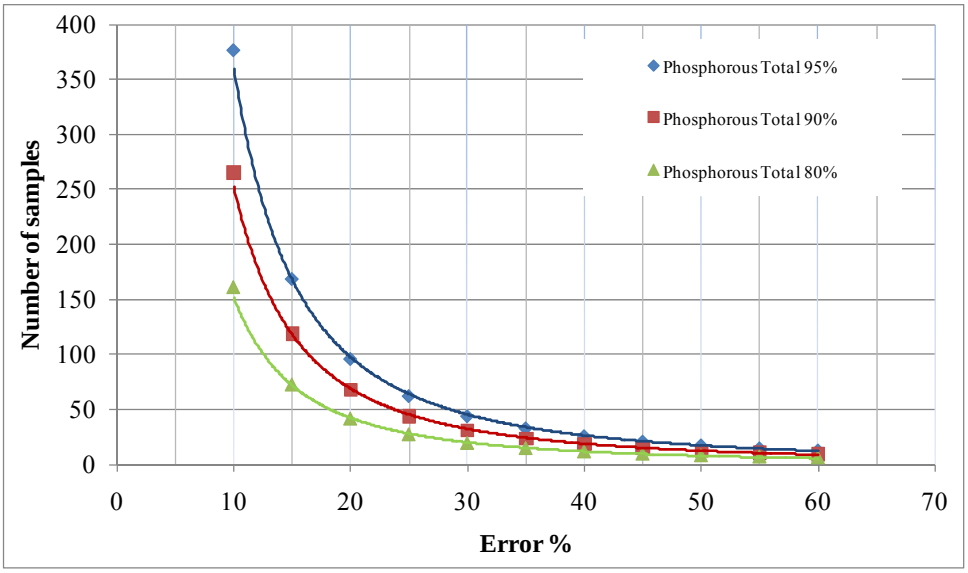

Figure 16. Number of samples vs. expected error for Total Phosphorus measured at sampling site SK05HG0283.

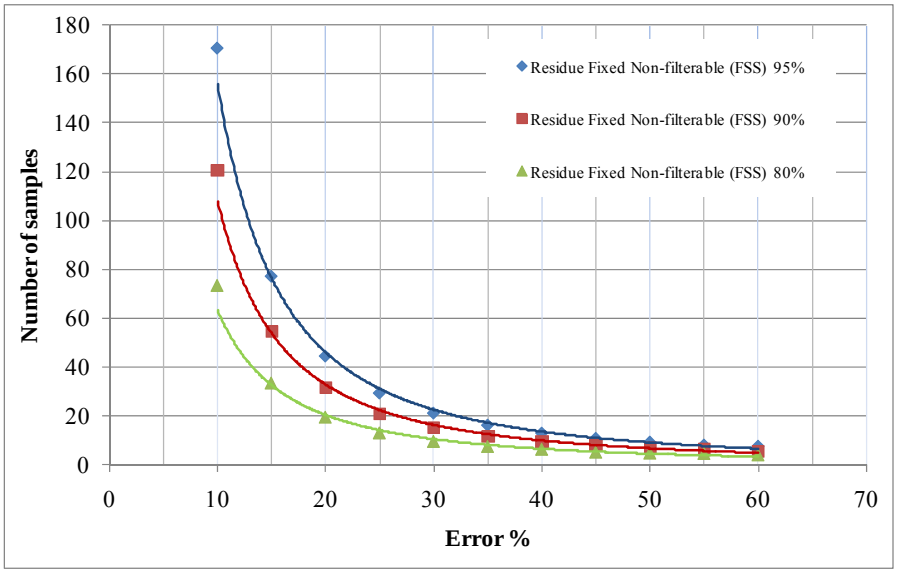

Figure 17. Number of samples vs. expected error for Fixed Non-Filterable Residue measured at sampling site SK05HG0283.

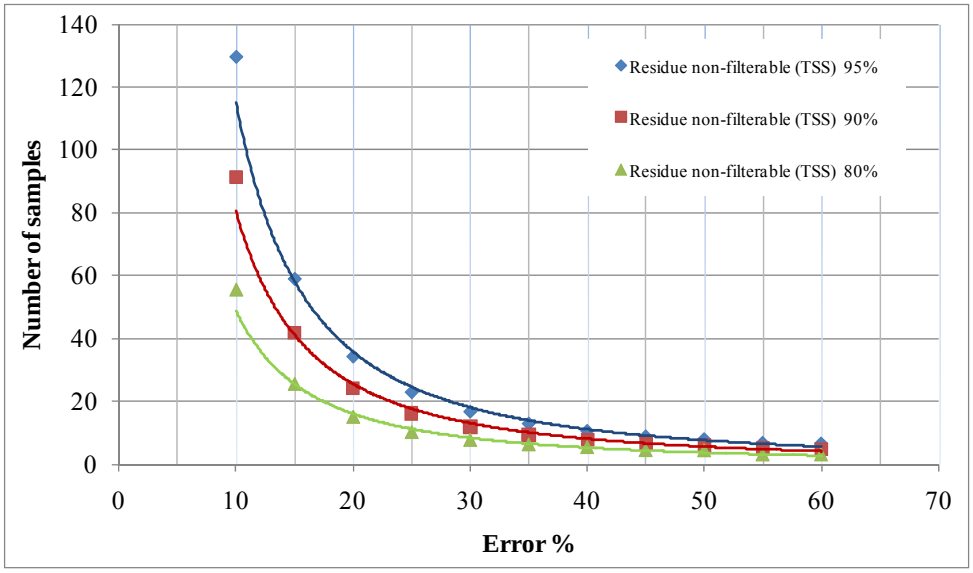

Figure 18. Number of samples vs. expected error for Non-Filterable Residue measured at sampling site SK05HG0283.

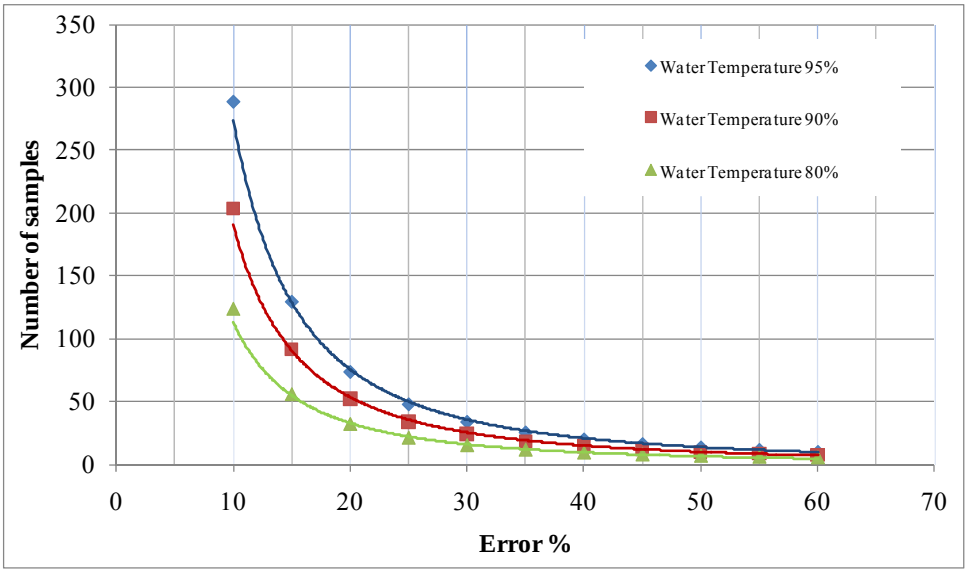

Figure 19. Number of samples vs. expected error for Water temperature measured at sampling site SK05HG0283.

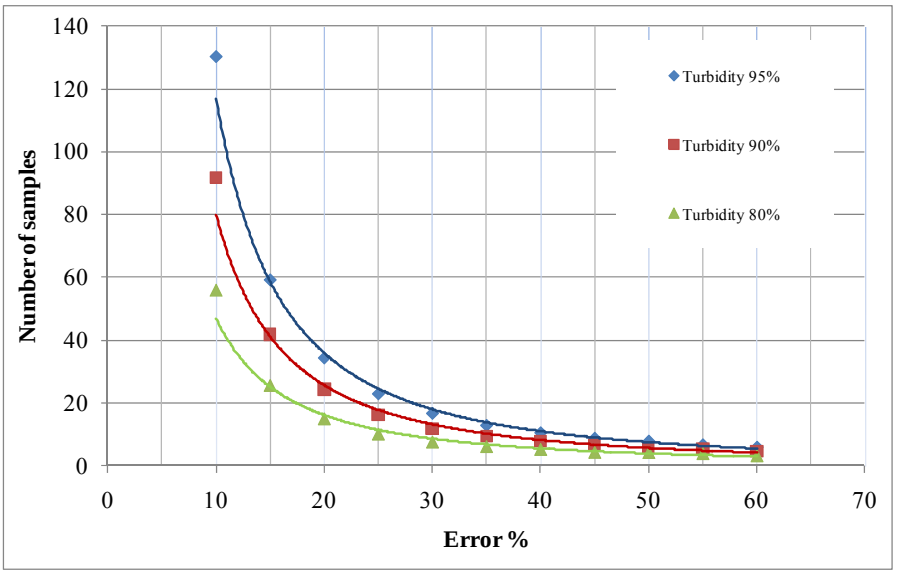

Figure 20. Number of samples vs. expected error for Turbidity measured at sampling site SK05HG0283.

At this point, the sampling frequency assessment was performed for each variable at each of the three monitoring stations. If uniform sampling is to be performed, Table 14 shows the expected error for the estimation of water quality variable mean values for 6, 12 and 26 samples per year.
For sampling site SK05HG0283, sampling frequency may be divided into four groups. The mean value for the first group variables can be estimated with small margin of error if measured four times a year:

- Alkalinity Total CaCO3;
- Bicarbonate;
- Calcium Dissolved;
- Hardness Total CaCO3;
- Magnesium Dissolved;
- Sodium Dissolved;
- Sulphate Dissolved; and
- pH.

In the second group, 6 samples per year are required for Dissolved Chloride. In the third group, for the Dissolved Carbon Organic; Dissolved Nitrogen/Nitrate and Dissolved Oxygen, 12 samples are required per year. A large variation was detected for the variablesin the fourth group: Fecal Streptococci, Total Kjeldahl Nitrogen, Total Phosphorous, FSS, TSS, Water Temperature and Turbidity. A conservative recommendation for variables in the fourth group, based on Table 14, would be to sample these parameters on a biweekly basis, ideally.

In case biweekly sampling is not feasible, it is recommended that monthly sampling would be applied and information transfer among variables or between sampling sites would be applied to fill gaps for the variables in the fourth group. A complete set of results for each of the sampling sites as well as recommendations for the Saskatchewan water quality monitoring network sampling frequency are presented in Appendix (H).

Table 14: Percentage of error expected based on collecting 6, 12 and 26 samples

Significant Level	**80%**			**90%**			**95%**		
Number of samples / year	**6**	**12**	**26**	**6**	**12**	**26**	**6**	**12**	**26**
Alkalinity Total $CaCO_3$[1]	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bicarbonate[1]	<10	<10	<10	<10	<10	<10	<10	<10	<10
Calcium Dissolved[1]	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dissolved Carbon Organic[3]	24	14	<10	30	18	12	40	22	14
Chloride Dissolved[2]	<10	<10	<10	18	10	<10	22	14	<10
Fecal Streptococci[4]	>60	50	32	>60	>60	43	>60	>60	54
Hardness Total $CaCO_3$[1]	<10	<10	<10	<10	<10	<10	<10	<10	<10
Magnesium Dissolved[1]	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dissolved NitrogenNitrate[3]	19	12	<10	25	10	10	30	18	12
Total Kjeldahl Nitrogen[4]	40	26	17	55	34	22	60	44	27
Oxygen Dissolved[3]	25	16	12	35	22	14	50	28	17
Total Phosphorous[4]	60	39	25	>60	53	33	>60	60	42
Residue Fixed Non-fiterable (FSS)[4]	40	28	17	55	35	22	>60	44	27
Residue Non-filterable (TSS)[4]	35	24	15	50	30	19	60	37	24
Sodium Dissolved[1]	<10	<10	<10	<10	<10	<10	10	<10	<10
Sulphate Dissolved[1]	<10	<10	<10	<10	<10	<10	10	<10	<10
Temperature Water[4]	50	34	22	>60	45	29	>60	55	35
Turbidity (NTU)[4]	35	24	15	50	30	18	60	43	24
pH[1]	<10	<10	<10	<10	<10	<10	<10	<10	<10

[1] 4 samples are required per year: [2] 6 samples are required per year: [3] 12 samples are required per year; [4] more than 12 samples are required per year

4 DISCUSSION AND CONCLUSIONS

Multivariate approaches were used in this study to identify potential redundancies in station location. It must be emphasized that this first analysis, albeit multivariate, is limited based on a data set comprising of only ten variables. These variables were not selected because of their relative importance for management decision, but rather because of their relatively high sample size. Statistical power may not be the preferred selection criterion and this aspect of the analysis could eventually be revisited.

Based on these variables, the results of both multivariate analyses indicate similar conclusions:

- A large number of provincial stations show similarities
- A limited (5) number of provincial stations (SK06AD0041, SK05JL0129, SK05JF0092, SK05HB0087 and SK05NB0198) are distinct and should remain in the network.
- There are three pairs of provincial-federal stations with similar statistical characteristics: Battle River (SAO5FE0001) and SK05FF0020, Assiniboine River (SAO5MD0002) and SK05MC0038, Churchill River (SAE6EA0003) and SK06CD0027.

Assessment of water quality variables was limited to water quality variables that were most frequently sampled (Those have 30 valid records or more). A water quality variables rationalization approach was applied for each of the MOE sampling sites separatley. Results indicate that there are information redundancies among water quality variables and considerable number of variables could be discontinued. However, the maximum number of variables to be discontinued varies between five variables for sampling sites SK05HG0283 and SK05HH0267 and 14 variables at sampling site SK05JF0092.

Water quality variables rationalization approach was applied for the EC sampling sites that are considered similar to MOE sites and serving the same watershed. Results showed that few variables may be added to the list of variables measured at two MOE sampling sites. However, final decision for variables to be added should be based also on watershed attributes.

The confidence interval around the mean is used as a criterion for the assessment of the sampling frequency. This approach assumes that the monitoring objectives are the determination of ambient water quality status and an assessment of annual means. The estimation of the required number of samples to estimate the mean with minimum error varies between water quality variables and from site to site. Results showed that water quality variables at each of the MOE sampling sites may be divided into four groups. The first group of variables could be sampled four times per year to estimate the mean value with a relatively small margin of error. Water quality variables of the second and third groups would require respectively 6 and 12 samples per year to achieve a similarly acceptable level of error. Given the large variability, variables of the fourth group would require higher sampling frequency, perhaps as high as biweekly in order to get an estimate of the mean value with acceptable uncertainty.

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APPENDIX A: PRELIMINARY ANALYSES (KHALIL ET AL., 2011).

Kolmogrov-Smirnov goodness of fit test

To check whether the water quality data followed a normal distribution, the Kolmogorov-Smirnov (K-S) test for normality is applied. The K-S is a nonparametric test for the equality of continuous, one-dimensional probability distributions that can be used to compare a sample with a reference probability distribution (one-sample K–S test). The K–S statistic quantifies a distance between the empirical cumulative distribution function $F_n(x)$ of the sample and the hypothesized cumulative distribution function of a reference distribution $F(x)$. If the difference between the sample $F_n(x)$ and the hypothesized $F(x)$ is too large, then the null hypothesis that $F_n(x) = F(x)$ cannot be accepted. The appropriate test statistic is the maximum value of the absolute difference between $F_n(x)$ and $F(x)$.

$$D = \max \left| F_n(x) - F(X) \right| \qquad \text{(A1)}$$

If D is too large, the null hypothesis is rejected. Specifically the criterion for rejection is:

$$D \succ d_{\alpha,n} \qquad \text{(A2)}$$

where $d_{\alpha,n}$ is the tabulated value of the Kolmogorov-Smirnov test statistic for significance level α and sample size n.

Modified Mann-Kendall nonparametric trend test

The Mann-Kendall trend test is a common nonparametric test employed to test for the existence of a trend. Mann (1945) first suggested using the significance test for Kendall's tau, where the x variable is time, as a test for trend (monotonic change). The null hypothesis is that there is no correlation (no trend) between observations (x_i) and time. The alternative hypothesis is that they are correlated (trend). Kendall's statistic S is calculated as:

$$S = \sum_{i<j} x_{ij} = \sum_{i<j} sqn\left(x_j - x_i\right) \tag{A3}$$

where

$$\text{sgn}\left(x_j - x_i\right) = \begin{Bmatrix} 1 & x_i < x_j \\ 0 & x_i = x_j \\ -1 & x_i > x_j \end{Bmatrix} \tag{A4}$$

Under the null hypothesis that x is independent and randomly ordered the statistic S tends to normality for large number of observations (n) with mean = 0 and variance given by:

$$\text{var}(S) = n\,(n-1)\,(2n-5)\,/18 \tag{A5}$$

The significance of the trend is tested by comparing the standardized test statistic $Z = S/\sqrt{\text{var}(S)}$ with the standard normal variate at the desired significance level. No assumption of normality is required, but there must be no autocorrelation for the resulting p-values to be correct. A modified Mann-Kendall nonparametric trend test which account for autocorrelation is proposed by Hamed and Rao (1997; 1998). They proposed an empirical formula for calculating the variance of S ($V(S)$) in the case of autocorrelated data as follows:

$$V(S) = \text{var}(S).\frac{n}{n_s} = \frac{n\,(n-1)\,(2n-5)}{18}.\frac{n}{n_s} \tag{A6}$$

Where n/n_s represents a correction due to the autocorrelation in the data, which is given be:

$$\frac{n}{n_s} = 1 + \frac{2}{n\left(n-1\right)\left(n-2\right)} \sum_{i=1}^{n-1} \left(n-i\right)\left(n-i-1\right)\left(n-i-2\right) \rho_s(i) \tag{A7}$$

where $\rho_s(i)$ is the autocorrelation function of the ranks of the data.

Autocorrelation

The plot of the autocorrelation function (ACF) against the lag time is called a correlogram. Since existence of trends affect the correlogram function, therefore, the time series should be adjusted (de-trended) before creating the correlogram. Given equi-spaced observations $(y_1, y_2, y_3, \ldots, y_n)$, the lag k autocorrelation is defined as:

$$r_k = \frac{\sum_{i=1}^{n-k} (y_i - \bar{y})(y_{i+k} - \bar{y})}{\sum_{i=1}^{n} (y_i - \bar{y})^2} \qquad \text{(A8)}$$

APPENDIX B: ASSESSMENT AND RATIONALIZATION OF SAMPLING SITES.

The main objective of the proposed approach is to identify similar sampling sites and possible sites to be discontinued. The approach consists of four main steps. In the first step, PCA was employed to convert the observed water quality variables into new uncorrelated variables (principle components) for each of the monitoring sites. Scores were projected in PC space to identify similarity among stations. In the second step the first three components were used in hierarchical cluster algorithm (HC) to define groups of similar sampling sites.

The two main multivariate statistics techniques employed in the proposed approach for the assessment and redesign of the sampling locations are described here below.

Principle Component Analysis (PCA)

The principle component analysis (PCA) creates a multivariate space in which the original WQ variables can be projected and their relative positions visualized in a smaller number of dimensions (principle components) than the original dataset (water quality variables). Mathematically, PCA produces several linear combinations (principle components) of observed water quality variables x_i. The components summarize the patterns of correlations in an observed correlation matrix. The factor loading matrix obtained from PCA reflects the characteristics of the extraction procedure, which maximizes the variance in each successive component, which are orthogonal to one another.

$$PC1 = \sum_{i=1}^{p} a_{1i} x_i \qquad \text{(B1)}$$

where a_{1i} is the weight of variable x_i. The variance explained by PC_1 is maximised under the constraint that the sum of the squared weights is equal to one.

$$\sum_{i=1}^{p} a_{1i}^2 = 1 \qquad \text{(B2)}$$

Hierarchical Cluster Analysis (CA)

Cluster analysis (CA) was performed on the matrix of means of 10 water quality variables for each of the 30 stations. CA is an exploratory data technique used to group similar observations into clusters, where the within-cluster variance is minimized and the between-cluster variance is maximized (Jobson, 1992).

An agglomerative hierarchical algorithm was employed to identify clusters of similar water quality sampling sites based on their principle component scores. Agglomerative algorithms begin with each site as a separate cluster and merge them into successively larger clusters. The Euclidean distance (*ED*) was employed as dissimilarity measure between sampling sites and Ward's algorithm was used to define agglomerative clusters. The Euclidian distance (ED) between site *X* with principle component scores (P_{x1}, P_{x2}, P_{x3}) and site *Y* with principle component scores (P_{y1}, P_{y2}, P_{y3}) is defined as follows:

$$ED_{XY} = \sqrt{\sum_{i=1}^{n} \left(WQ_{xi} - WQ_{yi}\right)^2} \qquad \text{(B3)}$$

where *n* is the number of principle components considered and ED is calculated between water quality variables (WQ) at each stations.

As for the Ward's algorithm, the objective function (*W*) (Ward, 1963) minimizes the sum of the squares of the site distances from the centres of their respective clusters:

$$W = \sum_{k=1}^{K} \sum_{j=1}^{P} \sum_{i=1}^{N_K} \left(S_{ijk} - C_{jk}\right)^2 \qquad \text{(B4)}$$

Ward's algorithm is good at recovering the cluster structure, and it tends to form clusters of equal size. This characteristic of Ward's algorithm makes it useful for the identification of groups of similar sampling sites.

APPENDIX C: WATER QUALITY VARIABLES RATIONALIZATION (KHALIL ET AL., 2010B)

Estimation of the mean and variance of streamflows or other hydrological variables at a gauge with a short time series from a longer, continuously measured gauge is termed record augmentation (Vogel and Stedinger, 1985). However, the extension of monthly, weekly or daily records is termed record extension. The following subsections present a short review of record augmentation and record extension approaches.

Record augmentation

Assume that the measured variable y has n_1 years of data and the measured variable x has $n_1 + n_2$ years of data, from which n_1 are concurrent with the data observed for y, illustrated as follows:

$$x_1, x_2, x_3, \ldots\ldots, x_{n_1}, x_{n_1+1}, x_{n_1+2}, \ldots\ldots, x_{n_1+n_2}$$
$$y_1, y_2, y_3, \ldots\ldots, y_{n_1}$$

In the case of water quality variables reduction, year n_1 can be considered as the year where assessment and selection took place. After n_1 years, assessment of the water quality variables reveals that monitoring of the variable y can be stopped, whereas measurement of variable x can be continued. Assume that after n_2 years our interest is to estimate the mean μ_y and the variance σ_y^2 of the variable y as accurately as possible. Matalas and Jacobs (1964) developed a procedure for obtaining unbiased estimators of both μ_y and σ_y^2, showing that the mean value ($\hat{\mu}_y$) of the extended series can be determined by the following:

$$\hat{\mu}_y = \bar{y}_1 + \frac{n_2}{n_1 + n_2}\hat{\beta}(\bar{x}_2 - \bar{x}_1) \qquad \text{(C1)}$$

where $\bar{y}_1$ and $\bar{x}_1$ are the mean values of y_i and x_i based on short records $i = 1, \ldots, n_1$; $\bar{x}_2$ is the mean value of x_i observed during the period $i = n_1 + 1, \ldots, n_2$; and the parameter $\hat{\beta}$ is the

estimated regression coefficient. Based on this formulation, it is possible to show (Cochran, 1953) that the variance of $\hat{\mu}_y$ is given by the following:

$$Var\{\hat{\mu}_y\} = \frac{\sigma_y^2}{n_1}\left[1 - \frac{n_2}{n_1 + n_2}\left(\rho^2 - \frac{1-\rho^2}{n_1 - 3}\right)\right] \tag{C2}$$

where σ_y^2 is the population variance of y and ρ is the population correlation between x and y. For practical use, these values may be replaced by their estimates based on the n_1 years of data (Ouarda, et al., 1996). To assess whether the extended series provides additional information on the variable y, the variance above must be compared with the variance obtained from the short record (σ_y^2/n_1), and the condition for an improved estimator (smaller variance) of the mean is given by the following:

$$\rho^2 > 1/(n_1 - 2) \tag{C3}$$

Therefore, estimation of the mean from the extended series is profitable only if the correlation coefficient between the two variables exceeds $(|n_1 - 2|)^{-1/2}$ (Ouarda et al., 1996). If the variance of the y-series is of interest, one can proceed as in the case of the mean. Matalas and Jacobs (1964) obtained the following expression for the unbiased variance estimator $\hat{\sigma}_y^2$:

$$\hat{\sigma}_y^2 = \hat{\beta}^2 s_x^2 + \left[1 - \frac{n_1 + n_2 - 3}{(n_1 - 3)(n_1 + n_2 - 1)}\right]\frac{n_1 - 1}{n_1 - 2}(s_{y1}^2 - \hat{\beta}\, s_{x1}^2) \tag{C4}$$

where s_x^2 is the variance estimate based on the entire x-series, and s_{y1}, s_{x1} are the standard deviations of y and x based on the short records $i = 1,\ldots,n_1$. Moreover, Matalas and Jacobs (1964) showed that the variance of the variance estimator ($Var\{\hat{\sigma}_y^2\}$) is given by the following:

$$Var\{\hat{\sigma}_y^2\} = \frac{2\sigma_y^4}{n_1 - 1} + \frac{n_2 \sigma_y^4}{(n_1 + n_2 - 1)^2 (n_1 - 3)}(A\rho^2 + B\rho + C) \tag{C5}$$

where

$$A = \frac{(n_2+2)(n_1-6)(n_1-8)}{(n_1-5)} + (n_1-4)\left(\frac{n_1 n_2 (n_1-4)}{(n_1-3)(n_1-2)} - \frac{2n_2(n_1-4)}{(n_1-3)} - 4\right) \quad \text{(C6)}$$

$$B = \frac{6(n_2+2)(n_1-6)}{(n_1-5)} + 2(n_1^2 - n_1 - 14) + (n_1-4)\left(\frac{2n_2(n_1-5)}{(n_1-3)} - 2(n_1+3) - \frac{2n_1 n_2 (n_1-4)}{(n_1-3)(n_1-2)}\right) \quad \text{(C7)}$$

$$C = 2(n_1+1) + \frac{3(n_2+2)}{(n_1-5)} - \frac{(n_1+1)(2n_1+n_2-2)(n_1-3)}{(n_1-1)} + (n_1-4)\left(\frac{2n_2}{(n_1-3)} + 2(n_1+1) + \frac{n_1 n_2 (n_1-4)}{(n_1-3)(n_1-2)}\right) \quad \text{(C8)}$$

The first term on the right-hand side in Equation B5 is equal to the variance of the variance estimator based on the n_1 years of the y-series; therefore, estimation is profitable when:

$$\rho^2 > (-B \pm \sqrt{B^2 - 4AC}) / 2A \quad \text{(C9)}$$

Khalil et al. (2010a) used Equations C3 and C9 as criteria for assessment of the required correlation coefficient threshold and identification of highly associated pairs of variables. By using such criteria, Khalil et al. (2010a) overcame the first disadvantage of the CR approach. In this study, the higher correlation coefficient obtained from Equations C3 and C9 is used as a criterion to evaluate the correlation coefficients among water quality variables measured at the seven selected locations.

Proposed approach

The approach proposed by Khalil et al. (2010a) consists of three main steps. The first step is to assess the level of association among the variables being measured and to define the groups of variables that are highly associated. Then, for each highly associated group of variables, the second step is to assume that each variable within the group would be discontinued and to identify the best auxiliary variable from the same group. The third step is to assess different combinations of variables to be discontinued and variables to be continuously measured.

Association Assessment

To identify highly associated water quality variables, cluster analysis was employed with criteria developed from the record augmentation procedures. Hierarchical clustering was performed in

two consecutive steps: 1) define dissimilarity between variables, and 2) define the linkage function between clusters. A matrix of association (correlation coefficients) is converted into a dissimilarity matrix by substituting each (r) with ($1-r^2$). In the second step, the average linkage function is used to define the various clusters. Khalil et al. (2010a) used Equations C3 and C9 to identify the dissimilar, highly correlated variables that may be grouped in clusters as follows:

$$d_m < 1 - \frac{1}{n_1 - 2} \qquad \text{(C10)}$$

$$d_v < 1 - \left(-B \pm \sqrt{B^2 - 4AC} \right) / 2A \qquad \text{(C11)}$$

Assessment of the correlation between water quality variables was applied for each of the seven sampling sites separately. It should be noted that some of the clusters contain only one variable each (single-variable cluster). The final, rationalised list of variables should ideally contain variables from all identified clusters of variables. If all variables of a particular cluster are discontinued, it will no longer be possible to extend data within that cluster. Thus, variables that form single-variable clusters should be continuously measured.

Best auxiliary variables

After identifying clusters of highly associated variables, the following step was to study each multiple-variable cluster separately. The approach assumes that each variable within the cluster is the variable to be discontinued. For each discontinued variable, the best auxiliary variable for record extension is selected from the other variables in the same cluster. In this study, Equation B2 was used to identify the best auxiliary variable that minimises the variance of the estimated mean of each discontinued variable.

Using Equation B2, the choice of the best auxiliary variable is based on the number of concurrent years of measurement, the correlation coefficient and the number of years after the assessment and reselection took place (n_2). One can assess the precision of the variance of the mean value estimator (Equation B2) after a certain number of years, assuming σ_y^2 and ρ remain unchanged and equal to their estimates based on n_1 years of data. In this study, n_2 is assumed to be three

years; therefore, reconstitution of information about discontinued variables would occur three years after the assessment and reselection took place.

Selection of discontinued variables

Khalil et al. (2010a) proposed an information index to define the optimum combination of variables that could be continuously measured or discontinued. For instance, consider the case where budget cuts require k variables to be discontinued. The question becomes which k variables among the w variables in the list of variables being measured should be selected? The number of possible combinations of variables to discontinue is given by the binomial coefficient $C(w,k)$. For each combination, the information index is computed and the combinations are ranked based on their information index values. Such a procedure provides the decision maker with the rank of the best combinations to discontinue. The aggregate information index (I_a) is defined as follows:

$$I_a = \sum_{variables\ X} \sqrt{Var\{\hat{\mu}\{X\}\}} \qquad \text{(C12)}$$

where X is the water quality variable and $Var\{\hat{\mu}\{X\}\}$ is the variance of the mean value estimator expected after n_2 years (Equation C2). This summation was performed over all variables in the study. For the discontinued variables, the variance of the mean value estimator after n_2 years was estimated using Equation C2. The population parameters in Equation C2 were replaced by their estimates based on the n_1 years of data. For continuously measured variables, the variance of the mean value after n_2 years was assumed to be equal to the variance of the mean after n_1 years multiplied by $(n_1-1)/(n_1+n_2-1)$. The performance index was applied to the standardised variables to remove the dimensionality and the scale effects from the variables. Using such an aggregated performance index, the second disadvantage in the conventional CR approach can be overcome.

APPENDIX D: CONFIDENCE INTERVAL APPROACH (KHALIL ET AL., 2011).

Confidence Interval around the mean

Assuming that the population variance is known and that the samples are independent, the variance of the sample mean ($\mathrm{var}(\bar{x})$) may be computed from the following equation:

$$\mathrm{var}(\bar{x}) = \frac{\sigma^2}{n} \qquad \text{(D1)}$$

where σ is the population variance and n is the number of samples. The number of samples required to obtain a given degree of confidence can be derived from the following (Sanders et al., 1983):

$$\left[\bar{x} - z_{\alpha/2}\,\mathrm{var}(\bar{x})^{\frac{1}{2}} \le \mu \le \bar{x} + z_{\alpha/2}\,\mathrm{var}(\bar{x})^{\frac{1}{2}} \right] \qquad \text{(D2)}$$

Replacing *var* **(** $\bar{x}$ **)** by σ^2/n, the n required to obtain a future estimate of the mean can be computed with a known level of confidence by the following (Sanders et al., 1983):

$$n \ge \left[\frac{z_{\alpha/2}\,\sigma}{\mu - \bar{x}} \right]^2 \qquad \text{(D3)}$$

Substituting the sample variance (s) instead of the population variance (σ) in Equation B3 requires Student's "*t*" statistic instead of *z*. The difference between the true population mean and the sample mean (μ-$\bar{x}$ **)** is sometimes referred to as the error (E) (Harmincioglu et al., 1999). This substitution results in the following:

$$n \ge \left[\frac{t_{\alpha/2}\,s}{E} \right]^2 \qquad \text{(D4)}$$

Using Equation D4, an acceptable confidence level (1-α) and the error (E) must be specified to determine n. Because the value of the t is dependent on the degree of freedom, which is dependent on the number of samples, Equation D4 computation becomes an iteration problem. An initial n value must be specified, from which a degree of freedom is calculated and used to find the t statistic. Equation D4 updated the value of n, and a new t statistic is found. These iterations are performed until the sample size converges to a relatively constant value.

In practice, autocorrelation may be present, in this case the variance of $\bar{x}$ is given by (Loftis and Ward, 1979):

$$Var(\bar{x}) = \frac{\sigma^2}{n}\left[1 + \frac{2}{n}\sum_{k=1}^{n-1}(n-k)\rho_k\right] \qquad \text{(D5)}$$

where σ^2 is the population variance. If the $Var(\bar{x})$ given by equation (D5) is substituted into equation (D4) results in a quadratic equation that can be solved for n. Gilbert (1987) obtained an approximate expression by ignoring the term in the quadratic equation that has n^2 in the denominator:

$$n = D\left[1 + 2\sum_{k=1}^{n-1}\rho_k\right] \qquad \text{where } D = \left[\frac{(t_{\alpha/2})\,s}{E}\right]^2 \qquad \text{(D6)}$$

The relationship between the mean confidence interval and the number of samples as described by equation (D4) becomes theoretically valid if the variance of the stationary component computed from different sampling intervals stabilizes after a certain sampling interval (Khalil and Ouarda, 2009). After this sampling interval, the variance becomes independent of the sampling interval and any change in the number of samples will only affect the expected error.

APPENDIX E: PRELIMINARY ANALYSES RESULTS.

Sampling site: SK05HF0206 (SASK_9)

Water Quality Variables	Algae at site	Algae in sample	Alkalinity Phenolphthalein CaCO3	Alkalinity CaCO3	Aluminum Total	Arsenic Total	Barium Total
no.	89	110	123	238	79	79	73
Average	0.2135	0.1273	6.4222	168.063	0.2114	1.3241	0.0793
Median	0	0	6	156	0.12	1.1	0.08
St-deviation	0.4121	0.3348	5.5635	52.1239	0.2659	0.8391	0.0131
variance	0.1698	0.1121	30.9521	2716.9005	0.0707	0.7042	0.0002
Minimum	0	0	0	126	0.007	0.5	0.049
Maximum	1	1	40	488	1.5	6	0.13
Skewness	1.3984	2.2367	3.3212	4.1371	2.6116	3.2493	0.9836
Kurtosis	2.9556	6.003	18.4898	19.8866	10.6873	15.5502	5.8968
Water Quality Variables	Bicarbonate	Boron Total	Calcium Dissolved	Calcium Hardness	Calcium Total	Carbon Dissolved Organic	Carbon Total
no.	178	42	149	92	54	173	50
Average	190.6344	0.0588	45.6242	115.0065	43.8519	3.9873	46.82
Median	180.412	0.03	46	116	44	4	38
St-deviation	55.6869	0.0898	4.327	15.5917	3.5203	1.1726	23.9853
variance	3101.0326	0.0081	18.7227	243.1011	12.3927	1.3749	575.2935
Minimum	98	0.004	28	13	36	1	27
Maximum	497.352	0.46	62	156	51	11.8	120
Skewness	4.0056	3.2605	0.3789	-2.6338	-0.1065	2.2488	2.1299
Kurtosis	19.8981	13.0826	6.5599	21.9535	2.3786	14.502	6.0613

Water Quality Variables	Carbon Total Inorganic	Carbon Total Organic	Carbonate (CALCD.)	Chloride Dissolved	Chlorophyll A	Chromium Total	Coliforms Fecal
no.	50	54	140	231	93	51	105
Average	39.08	8.463	6.9191	8.0459	8.4303	0.0047	35.0476
Median	33	5.5	6.6	6	5.2	0.004	10
Standard deviation	19.4536	9.3843	6.5927	7.1881	12.3563	0.0038	59.6431
variance	378.4424	88.0646	43.4634	51.6688	152.6792	0	3557.2958
Minimum	23	1	0.72	2	0.27	0.001	0
Maximum	105	65	48	60	87	0.022	270
Skewness	2.2844	4.2872	3.2526	3.9967	4.734	2.3372	2.6578
Kurtosis	7.0833	25.6766	18.5469	23.5376	28.1113	10.4563	9.5752

Water Quality Variables	Coliforms Total	Conductance	Copper Total	Cyanide Total	Fecal Streptococci	Fluoride Dissolved	HARDNESS Total (CALCD.) CaCO3
no.	135	208	62	36	131	22	149
Average	575.9259	443.9394	0.0149	2.8295	59.0534	0.1564	182.9463
Median	70	420	0.005	1.8	20	0.16	182
Standard deviation	2549.2954	124.9928	0.0434	2.5401	168.2937	0.0189	16.0193
variance	6498906.965	15623.2048	0.0019	6.4521	28322.7587	0.0004	256.6187
Minimum	0	226	0.0008	0.012	1	0.11	42
Maximum	22000	1300	0.32	9	1760	0.19	212
Skewness	6.6005	3.7297	6.0296	1.0526	8.3216	-0.411	-4.4176
Kurtosis	49.1818	20.7936	41.3513	2.8426	81.9072	3.3051	41.3708

Water Quality Variables	Iron Total	Magnesium Dissolved	Magnesium Total	Manganese Total	Nickel Total	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia
no.	74	148	62	74	62	183	192
Average	0.227	16.9662	16.4516	0.0189	0.0092	0.171	0.1033
Median	0.11	17	16	0.0098	0.003	0.11	0.06
Standard deviation	0.3349	2.5883	2.252	0.0346	0.0428	0.4406	0.1625
variance	0.1121	6.6995	5.0714	0.0012	0.0018	0.1942	0.0264
Minimum	0.012	6	12	0.004	0.001	0.01	0.01
Maximum	1.7	30	27	0.26	0.34	5.3	1
Skewness	3.049	0.8356	1.5617	5.3868	7.6302	9.9153	3.5505
Kurtosis	12.4719	8.8653	9.2406	35.0104	59.4865	108.864	16.101
Water Quality Variables	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved	Oxygen Dissolved	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved
no.	240	207	96	136	130	202	146
Average	0.615	1.2121	11.9572	11.3449	0.0353	0.0765	2.6829
Median	0.5	1	11.2	11.5	0.02	0.04	3
Standard deviation	0.4776	1.0859	3.8423	2.525	0.0399	0.1053	0.6582
variance	0.2281	1.1791	14.763	6.3758	0.0016	0.0111	0.4333
Minimum	0.1	0.2	7.6	2	0	0.01	1.9
Maximum	3.3	8.5	32.37	18.7	0.21	0.75	5
Skewness	2.85	3.5872	3.6592	-0.8868	2.5918	3.7835	0.9049
Kurtosis	12.6944	18.7851	18.1697	5.6566	9.8963	20.0588	4.4716

Water Quality Variables	Potassium Total	Residue Fixed Non-filterable (FSS)	Residue Non-filterable (TSS)	Residue Volatile non-filterable (VSS)	Silicon Total	Sodium Dissolved	Sodium Total
no.	59	226	240	213	43	150	61
Average	2.6424	8.7743	10.7	2.3944	0.6314	24.7867	22.8689
Median	2.3	4	5	2	0.4	22	20
St-deviation	1.0011	20.1774	21.6884	2.3939	0.96	20.1596	17.3219
variance	1.0021	407.1266	470.3866	5.7305	0.9215	406.4106	300.0492
Minimum	1	1	1	0	0.06	14	13
Maximum	6.7	244	267	23	6.4	173	150
Skewness	1.5717	8.0806	7.9665	4.6245	5.1969	6.591	6.6597
Kurtosis	6.8133	86.3616	85.8566	32.7922	31.8205	46.0666	49.215

Water Quality Variables	Specific Conductance	Sulphate	Sulphate Dissolved	Water Temperature	Titanium Total	Total Dissolved Solids	Turbidity NTU	pH
no.	242	124	27	225	40	128	53	239
Average	448.3554	62.5968	72.1926	8.9192	0.0043	352.8984	2.2487	8.2875
Median	419	60	70.2	8	0.003	341.5	1.8	8.4
St-deviation	146.5418	14.3747	7.1883	7.1385	0.0043	77.1135	1.6292	0.4165
variance	21474.5122	206.6328	51.6715	50.9579	0	5946.4857	2.6542	0.1735
Minimum	300	45	61.2	0	0.0005	263	0.45	3.4
Maximum	1200	149	91.9	25	0.018	846	8.58	8.9
Skewness	3.685	3.3436	1.2682	0.2248	1.8943	5.4892	2.1697	-7.2323
Kurtosis	16.5063	18.8435	4.3627	1.5796	6.1616	34.4354	8.0443	81.43

WQV code	Water Quality Variables	Mann-Kendal trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Fecal Streptococci no/100ml	-0.811	0.418	0.365	0.306	-0.365	4.178	0.000
2	Fluoride Dissolved mg/L	-1.240	0.215	0.167	0.145	-0.167	0.784	0.570
3	HARDNESS Total CACO3 - mg/L	-0.804	0.421	0.120	0.098	-0.120	1.461	0.028
4	Iron Total - mg/L	-5.130	0.000	0.265	0.265	-0.260	2.281	0.000
5	Magnesium Dissolved mg/L	0.930	0.353	0.183	0.183	-0.136	2.222	0.000
6	Magnesium Total mg/L	2.259	0.024	0.162	0.162	-0.098	1.275	0.078
7	Manganese Total mg/L	-2.991	0.003	0.338	0.338	-0.334	2.911	0.000
8	Nickel Total mg/L	-5.700	0.000	0.444	0.444	-0.424	3.497	0.000
9	Nitrogen Dissolved NO3 & NO2 mg/L	0.078	0.938	0.360	0.329	-0.360	4.876	0.000
10	Nitrogen Total Ammonia mg/L	-0.691	0.490	0.331	0.331	-0.283	4.586	0.000
11	Nitrogen Total Kjeldahl mg/L	-2.709	0.007	0.254	0.254	-0.184	3.938	0.000
12	Oxygen Biochemical Demand mg/L	-2.987	0.003	0.263	0.263	-0.188	3.782	0.000
13	Oxygen Dissolved mg/L	0.850	0.395	0.241	0.241	-0.164	2.359	0.000
14	Oxygen Dissolved mg/L	-0.522	0.602	0.093	0.084	-0.093	1.082	0.193
15	Phosphorous Dissolved Ortho mg/L	-0.190	0.849	0.299	0.299	-0.255	3.409	0.000
16	Phosphorous Total mg/L	-1.038	0.299	0.295	0.295	-0.266	4.191	0.000
17	Potassium Dissolved mg/L	1.762	0.078	0.267	0.246	-0.267	3.229	0.000
18	Potassium Total mg/L	2.446	0.014	0.155	0.155	-0.111	1.190	0.118
19	Residue Fixed Non-filterable mg/L	-3.351	0.001	0.350	0.301	-0.350	5.262	0.000
20	Residue Non-filterable mg/L	-3.386	0.001	0.327	0.295	-0.327	5.071	0.000
21	Residue Volatile non-filterable mg/L	-0.931	0.352	0.298	0.298	-0.275	4.347	0.000
22	Silicon Total mg/L	4.393	0.000	0.276	0.257	-0.276	1.809	0.003

WQV Code	Water Quality Variables	Mann-Kendal trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
23	Sodium Dissolved mg/L	1.927	0.054	0.383	0.383	-0.318	4.690	0.000
24	Sodium Total mg/L	1.931	0.054	0.346	0.346	-0.292	2.705	0.000
25	Specific Conductance µSie/cm	3.785	0.000	0.319	0.319	-0.214	4.956	0.000
26	Sulphate mg/L	-1.786	0.074	0.157	0.157	-0.123	1.752	0.004
27	Sulphate Dissolved mg/L	0.900	0.368	0.203	0.203	-0.096	1.056	0.214
28	Water Temperature deg C	0.456	0.649	0.150	0.150	-0.106	2.253	0.000
29	Titanium Total mg/L	-2.982	0.003	0.206	0.206	-0.189	1.304	0.067
30	Total Dissolved Solids mg/L	-0.870	0.384	0.317	0.317	-0.251	3.585	0.000
31	Turbidity NTU	1.944	0.052	0.191	0.191	-0.135	1.392	0.042
32	pH	3.234	0.001	0.245	0.185	-0.245	3.792	0.000

Sampling site: SK05HG0283 (SASK_10)

Water Quality Variables	Alkalinity Total CaCO3	Bicarbonate (CALCD.)	Calcium Dissolved	Carbon Dissolved Organic	Chloride Dissolved
no.	39	39	38	37	39
Average	157.7692	186.4159	47.1316	4.5811	8.0333
Median	160	188	47	4.4	8.3
Standard deviation	6.1877	8.7709	2.0424	1.6031	1.6007
variance	38.2874	76.9292	4.1714	2.5699	2.5623
Minimum	144	163	43	3	2
Maximum	167	203	51	12.2	11.8
Skewness	-0.6978	-0.6968	-0.2765	3.2972	-1.2089
Kurtosis	2.4717	3.5024	2.4952	15.7089	6.7582
Water Quality Variables	Fecal Streptococci	Hardness Total CaCO3	Magnesium Dissolved	Nitrogen Dissolved Nitrate	Nitrogen Total Kjeldahl
no.	34	38	38	34	33
Average	201.8235	188.5263	17.2368	0.2021	0.363
Median	100	190	17	0.22	0.3
Standard deviation	258.2746	8.7972	1.0764	0.0586	0.2363
variance	66705.79	77.3912	1.1586	0.0034	0.0558
Minimum	2	169	15	0.09	0.2
Maximum	970	210	20	0.3	1.5
Skewness	1.5854	-0.2506	-0.2188	-0.4653	3.6538
Kurtosis	4.6737	2.9523	3.3062	2.1133	17.5815

Water Quality Variables	Oxygen Dissolved	Phosphorous Total	Residues Fixed Nonfiltrable (FSS)	Residue Nonfiltrable (TSS)	Sodium Dissolved
no.	31	39	39	39	38
Average	11.9326	0.0444	9.3333	11.1795	23.8158
Median	10.44	0.03	8	9	24
Standard deviation	5.0792	0.0438	6.1786	6.4313	2.5559
variance	25.7981	0.0019	38.1754	41.3617	6.5327
Minimum	7.66	0.02	1	3	18
Maximum	30.66	0.25	26	29	29
Skewness	2.7654	3.5162	1.0696	1.1486	-0.4613
Kurtosis	10.2933	15.7115	3.4955	3.6427	2.8947
Water Quality Variables	Sulphate Dissolved	Temperature Water (DEG C)	Turbidity (NTU)	pH	
no.	34	32	38	39	
Average	70.4941	10.1472	4.1597	8.3333	
Median	71.7	10.85	3.45	8.4	
Standard deviation	7.0182	8.7629	2.3979	0.1782	
variance	49.2557	76.7889	5.7497	0.0318	
Minimum	58.2	0	1.07	7.4	
Maximum	90.9	25.7	12	8.6	
Skewness	0.5166	0.1965	1.3974	-3.6801	
Kurtosis	3.8152	1.5924	4.7245	20.5857	

WQV Code	Water Quality Variables	Mann-Kendall trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	1.6931	0.0904	0.152784	0.072777	-0.15278	0.941822	0.337631
2	Bicarbonate (CALCD.)	1.2684	0.2046	0.199784	0.084754	-0.19978	1.231554	0.096288
3	Calcium Dissolved	2.191	0.0285	0.158527	0.101197	-0.15853	0.977226	0.295216
4	Carbon Dissolved Organic	2.9471	0.0032	0.295665	0.295665	-0.162	1.798463	0.003102
5	Chloride Dissolved	1.8708	0.0614	0.130808	0.108151	-0.13081	0.806353	0.533842
6	Fecal Streptococci no/100ml	-0.185	0.8534	0.271364	0.271364	-0.21956	1.582312	0.013376
7	Hardness Total CaCO3	2.1525	0.0314	0.11915	0.11884	-0.11915	0.734489	0.653314
8	Magnesium Dissolved	1.7724	0.0763	0.208206	0.186531	-0.20821	1.28347	0.074163
9	Nitrogen Dissolved Nitrate	0.7797	0.4355	0.149654	0.077499	-0.14965	0.872623	0.431619
10	Nitrogen Total Kjeldahl	-4.157	0	0.325167	0.325167	-0.25556	1.839423	0.002302
11	Oxygen Dissolved	-1.357	0.1749	0.268974	0.268974	-0.19849	1.47323	0.026052
12	Phosphorous Total	-2.454	0.0141	0.301097	0.278484	-0.3011	1.831504	0.00244
13	Residues Fixed Nonfiltrable (FSS)	-0.742	0.4582	0.146597	0.146597	-0.10964	0.903687	0.387661
14	Residue Nonfiltrable (TSS)	-0.426	0.6703	0.161542	0.161542	-0.12431	0.995811	0.274517
15	Sodium Dissolved	1.0446	0.2962	0.137954	0.091131	-0.13795	0.850407	0.464702
16	Sulphate Dissolved	0.3315	0.7402	0.149605	0.149605	-0.08639	0.872339	0.432033
17	Temperature Water (DEG C)	1.3557	0.1752	0.200369	0.200369	-0.1284	1.115609	0.165863
18	Turbidity (NTU)	0.1384	0.8899	0.187203	0.187203	-0.09878	1.154	0.13937
19	pH	2.3095	0.0209	0.303987	0.239986	-0.30399	1.8739	0.001782

Sampling site: SK05FF0020 (SASK_11)

Water Quality Variables	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Bicarbonate	Calcium Dissolved	Carbon Dissolved Organic	Carbonate (CALCD.)	Chloride Dissolved
no.	32	35	34	35	33	32	35
Average	8.9009	348.2514	405.3824	60.5143	13.4	10.6969	30.0429
Median	9.61	342	386.5	54	12	11.5	33
Standard deviation	4.8339	97.3734	125.2048	22.2663	4.8788	5.8489	9.8795
variance	23.3667	9481.577	15676.24	495.7866	23.8025	34.21	97.6055
Minimum	0	143	143	30	8.6	0	3.4
Maximum	16.3	648	791	124	32.8	20	48.2
Skewness	-0.514	0.7964	1.0063	1.2371	2.9632	-0.495	-0.5577
Kurtosis	2.3134	4.7656	4.8258	3.9949	11.5889	2.3164	3.0463
Water Quality Variables	Hardness Total CaCO3	Magnesium Dissolved	Nitrogen Total Kjeldahl	Oxygen Dissolved	Oxygen Total COD	Phosphorous Total	Potassium Dissolved
no.	35	34	33	30	33	35	35
Average	283.1714	32.1765	1.1021	8.8483	36.5333	0.1417	9.2286
Median	263	33.5	0.9	8.85	34	0.11	9
Standard deviation	87.3763	8.9898	0.575	3.3885	12.8951	0.1071	2.0592
variance	7634.617	80.8164	0.3307	11.4822	166.2848	0.0115	4.2403
Minimum	149	15	0.3	0.7	19	0.03	2
Maximum	548	58	3.2	15.08	74	0.46	14
Skewness	1.1136	0.3012	1.6182	-0.5659	0.9067	1.4711	-0.7015
Kurtosis	4.2281	3.7414	6.4672	3.3667	3.4605	4.4706	6.1232

Water Quality Variables	Residue Fixed Non-filterable (FSS)	Residue Non-filterable Non-filterable (TSS)	Sodium Dissolved	Sulphate Dissolved	Water Temperature	Turbidity	pH
no.	33	34	35	30	32	34	35
Average	33.4545	39.3824	127.7857	171.95	11.9006	20.5838	8.3814
Median	13	15.5	140	178	13.55	9.73	8.5
Standard deviation	49.2945	56.147	39.0251	48.2489	8.2657	27.0417	0.3029
variance	2429.943	3152.486	1522.96	2327.956	68.3216	731.2559	0.0918
Minimum	2	2	14	62.6	0	2	7.6
Maximum	187	220	193	265.7	23.2	120	8.8
Skewness	2.0725	2.0921	-1.0218	-0.553	-0.2281	2.3699	-1.4755
Kurtosis	6.1526	6.31	3.7579	3.2369	1.6211	7.9896	4.0744

WQV code	Water Quality Variables	Mann-Kendal trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Phenolphthalein CaCO3	-0.439	0.661	0.094	0.092	-0.094	0.530	0.941
2	Alkalinity Total CaCO3 mg/L	1.960	0.050	0.184	0.184	-0.127	1.088	0.187
3	Bicarbonate mg/L	2.061	0.039	0.207	0.207	-0.122	1.206	0.109
4	Calcium Dissolved mg/L	1.748	0.080	0.184	0.184	-0.101	1.090	0.186
5	Carbon Dissolved Organic mg/L	-0.465	0.642	0.243	0.243	-0.200	1.398	0.040
6	Carbonate (CALCD.) mg/L	-0.390	0.696	0.114	0.091	-0.114	0.647	0.796
7	Chloride Dissolved mg/L	2.756	0.006	0.155	0.100	-0.155	0.915	0.373
8	Hardness Total (CALCD.) CaCO3	2.112	0.035	0.176	0.176	-0.107	1.042	0.227
9	Magnesium Dissolved	2.332	0.020	0.110	0.100	-0.110	0.640	0.807
10	Nitrogen Total Kjeldahl	-1.722	0.085	0.153	0.153	-0.126	0.876	0.426
11	Oxygen Dissolved	0.125	0.901	0.130	0.055	-0.130	0.710	0.694
12	Oxygen Total COD	-1.534	0.125	0.132	0.132	-0.087	0.755	0.618
13	Phosphorous Total	-0.717	0.474	0.237	0.237	-0.148	1.405	0.039
14	Potassium Dissolved	-2.365	0.018	0.190	0.125	-0.190	1.122	0.161
15	Residue Fixed non-filterable (FSS)	-0.827	0.408	0.300	0.300	-0.262	1.721	0.005
16	Residue Non-filterable (TSS)	-1.015	0.310	0.289	0.289	-0.253	1.684	0.007
17	Sodium Dissolved	1.834	0.067	0.172	0.133	-0.172	1.015	0.254
18	Sulphate Dissolved	2.248	0.025	0.156	0.100	-0.156	0.853	0.461
19	Water Temperature	0.011	0.991	0.132	0.132	-0.119	0.747	0.631
20	Turbidity	-0.994	0.320	0.261	0.261	-0.246	1.523	0.019
21	pH	0.440	0.660	0.281	0.207	-0.281	1.661	0.008

Sampling site: SK06AG0022 (SASK_12)

Water Quality Variables	Alkalinity Total CaCO3	Barium Total	Bicarbonate (CALCD.)	Boron Total	Calcium Dissolved	Carbon Dissolved Organic	Chloride Dissolved
no.	41	34	76	30	99	89	94
Average	182.878	0.0514	210.5116	0.0652	38.8051	14.2416	3.7394
Median	170	0.05	204.5	0.042	37	13.3	3.4
Standard deviation	36.5268	0.0089	41.1591	0.085	8.018	6.4754	1.7341
variance	1334.21	0.0001	1694.071	0.0072	64.288	41.9309	3.0071
Minimum	119	0.032	145.061	0.016	27	4	1.7
Maximum	285	0.078	364	0.5	69	59.8	12.5
Skewness	0.6708	0.9288	1.1918	4.6757	1.1231	5.029	2.4482
Kurtosis	2.9048	4.6134	5.3869	24.4577	4.3101	33.3747	11.5457
Water Quality Variables	Chlorophyll A mg/L	Coliforms Total	Conductance µSie/cm	Fluoride Dissolved	Hardness Total (CALCD.) CaCO3	Iron Total	Magnesium Dissolved
no.	79	31	79	61	87	32	99
Average	0.0085	147.9355	335.7734	0.127	162.4167	0.4319	16.5677
Median	0.0064	100	316.1	0.13	158	0.37	16
Standard deviation	0.0064	205.7043	75.9229	0.024	29.6569	0.2202	2.964
variance	0	42314.26	5764.281	0.0006	879.533	0.0485	8.7851
Minimum	0.0009	10	200	0.07	109	0.18	10
Maximum	0.0262	1100	565	0.18	262.8548	1.39	26
Skewness	0.7724	3.4421	0.9454	-0.2847	0.8311	2.6781	0.3607
Kurtosis	2.6789	16.135	3.6694	2.6996	3.7203	12.3186	3.4802

Water Quality Variables	Manganese Total mg/L	Nitrogen Dissolved NO3 & NO2	Nitrogen Total	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved
no.	31	34	39	34	75	28	40
Average	0.0981	0.0787	0.7931	0.1188	0.9612	1.7893	9.147
Median	0.065	0.07	0.8	0.09	0.9	1.4	8.87
Standard deviation	0.1118	0.0604	0.1531	0.0989	0.3749	1.6547	3.0092
variance	0.0125	0.0036	0.0235	0.0098	0.1405	2.738	9.0553
Minimum	0.021	0.01	0.5	0.02	0.48	0.4	4.71
Maximum	0.59	0.24	1.05	0.4	3	8.7	20
Skewness	3.3041	0.8129	0.041	1.3936	2.7112	2.9521	1.3011
Kurtosis	13.9639	2.8403	1.9228	4.4104	13.8197	12.3388	5.8244
Water Quality Variables	Oxygen Total COD	PH	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved	Residue Fixed Non-filterable (FSS)	Residue Non-filterable (TSS)
no.	57	77	59	49	98	74	96
Average	36.9842	7.6266	0.0456	0.1018	3.0714	7.8919	10.2708
Median	37.7	7.71	0.04	0.08	3	4	6
Standard deviation	8.9699	0.6638	0.0159	0.066	0.8973	11.932	12.7091
variance	80.4585	0.4406	0.0003	0.0044	0.8052	142.3717	161.5208
Minimum	19.9	5.58	0.02	0.05	1.6	1	1
Maximum	58.1	8.9	0.11	0.49	8	78	89
Skewness	0.1613	-0.8404	1.1638	4.4247	1.9884	3.797	3.8197
Kurtosis	2.774	3.7069	6.14	25.8587	11.5807	19.9671	20.7206

Water Quality Variables	Residue Volatile Non-filterable (VSS)	Sodium Dissolved	Specific Conductance µSie/CM	Sulphate Dissolved
no.	49	99	99	76
Average	3.3878	13.6556	353.9556	9.0816
Median	3	13	339	8.75
Standard deviation	2.5724	3.0822	67.0369	3.9656
variance	6.6173	9.4998	4493.945	15.7261
Minimum	1	7	247	0.8
Maximum	14	25	573	30
Skewness	2.093	0.8555	1.0085	2.2252
Kurtosis	8.342	4.2508	3.923	12.4263
Water Quality Variables	Turbidity NTU	pH	Water temperature	Total Dissolved Solids (TDS)
no.	83	99	78	49
Average	6.5531	7.9876	8.8425	298.5918
Median	4.8	8.1	8.18	290
Standard deviation	5.9823	0.2997	7.8566	58.7629
variance	35.7875	0.0898	61.7266	3453.08
Minimum	1.28	7.1	-0.23	209
Maximum	38	8.5	23	503
Skewness	3.0001	-0.6127	0.124	0.96
Kurtosis	13.6342	2.702	1.4503	4.4886

WQV	Water Quality Variables	Mann-Kendall trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3 mg/L	1.775	0.076	0.168	0.168	-0.114	1.077	0.197
2	Barium Total mg/L	-0.536	0.592	0.207	0.207	-0.119	1.205	0.109
3	Bicarbonate (CALCD.) mg/L	0.767	0.443	0.119	0.119	-0.056	1.041	0.229
4	Boron Total mg/L	-3.846	0.000	0.308	0.308	-0.306	1.685	0.007
5	Calcium Dissolved mg/L	-0.717	0.474	0.128	0.128	-0.079	1.270	0.079
6	Carbon Dissolved Organic mg/L	2.234	0.026	0.257	0.257	-0.211	2.425	0.000
7	Chloride Dissolved mg/L	-0.213	0.832	0.185	0.185	-0.126	1.793	0.003
8	Chlorophyll A mg/L	2.420	0.016	0.138	0.138	-0.115	1.225	0.099
9	Coliforms Total no/100ml	0.751	0.453	0.285	0.285	-0.251	1.585	0.013
10	Conductance USie/cm	-3.709	0.000	0.122	0.122	-0.079	1.083	0.191
11	Fluoride Dissolved mg/L	0.954	0.340	0.132	0.087	-0.132	1.029	0.240
12	Hardness Total CaCO3 mg/L	-0.296	0.767	0.121	0.121	-0.057	1.131	0.155
13	Iron Total mg/L	-1.480	0.139	0.191	0.191	-0.134	1.081	0.193
14	Magnesium Dissolved mg/L	-0.986	0.324	0.101	0.101	-0.066	1.007	0.263
15	Mangamese Total mg/L	1.003	0.316	0.332	0.332	-0.245	1.848	0.002
16	Nitrogen Dissolved NO3 & NO2 mg/L	2.114	0.035	0.180	0.180	-0.128	1.051	0.219
17	Nitrogen Total mg/L	-0.511	0.610	0.117	0.097	-0.117	0.729	0.662
18	Nitrogen Total Ammonia mg/L	-1.056	0.291	0.164	0.164	-0.159	0.955	0.322
19	Nitrogen Total Kjeldahl mg/L	-2.848	0.004	0.192	0.192	-0.131	1.659	0.008
20	Oxygen Biochemical Demand mg/L	1.317	0.188	0.272	0.272	-0.201	1.437	0.032
21	Oxygen Dissolved mg/L	-1.049	0.294	0.143	0.143	-0.071	0.903	0.388
22	Oxygen Total COD mg/L	0.219	0.827	0.070	0.070	-0.058	0.525	0.945
23	PH	-2.885	0.004	0.084	0.068	-0.084	0.733	0.656

WQV Code	Water Quality Variables	Mann-Kendall trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
24	Phosphorous Dissolved Ortho mg/L	-0.289	0.773	0.170	0.170	-0.125	1.309	0.065
25	Phosphorous Total mg/L	0.148	0.882	0.247	0.247	-0.243	1.727	0.005
26	Potassium Dissolved mg/L	-0.030	0.976	0.246	0.246	-0.162	2.435	0.000
27	Residue Fixed Non-filterable (FSS) mg/L	1.913	0.056	0.282	0.266	-0.282	2.424	0.000
28	Residue Non-filterable (TSS) mg/L	1.971	0.049	0.248	0.248	-0.247	2.430	0.000
29	Residue Volatile Non-filterable (VSS)	1.630	0.103	0.213	0.213	-0.177	1.491	0.023
30	Sodium Dissolved mg/L	-0.545	0.586	0.130	0.130	-0.093	1.290	0.072
31	Specific Conductance µSie/CM	-0.717	0.474	0.123	0.123	-0.063	1.225	0.099
32	Sulphate Dissolved mg/L	-0.022	0.982	0.162	0.162	-0.104	1.414	0.037
33	Water temperature deg C	-1.675	0.094	0.200	0.200	-0.124	1.765	0.004
34	Total Dissolved Solids (TDS) mg/L	-0.549	0.583	0.088	0.088	-0.064	0.616	0.843
35	Turbidity NTU	3.073	0.002	0.237	0.237	-0.199	2.160	0.000
36	pH	0.582	0.561	0.151	0.098	-0.151	1.505	0.022

Sampling site: SK06CD0027 (SASK_13)

Water Quality Variables	Alkalinity Total CaCO3	Bicarbonate	Calcium Dissolved	Carbon Dissolved Inorganic	Carbon Dissolved Organic	Carbon Particulate Organic	Chloride Dissolved
no.	83	61	83	30	71	38	80
Average	71.0554	85.7135	15.8241	15.6167	8.9366	0.5908	2.5275
Median	70	83.1358	15.9	15	8.7	0.59	2.45
Standard deviation	10.0381	11.8662	2.0924	2.4786	1.583	0.2348	0.697
variance	100.7645	140.8059	4.3779	6.1435	2.5059	0.0551	0.4858
Minimum	48	65.826	12	12	6.1	0.14	1.7
Maximum	96	117.024	22.9	21	13.2	0.96	7.2
Skewness	0.4506	0.7345	0.852	0.4222	0.6023	-0.406	3.9611
Kurtosis	2.9479	3.0766	4.0353	2.5545	2.853	2.1504	26.5839
Water Quality Variables	Chlorophyll A	Conductance µSie/cm	Fluoride Dissolved	Hardness Total CaCO3	Iron Extractable	Magnesium Dissolved	Manganese Extractable
no.	70	60	67	83	31	83	37
Average	0.0073	301.6683	0.0898	65.9722	0.0595	6.4193	0.0488
Median	0.007	150.5	0.09	65	0.06	6.2	0.05
Standard deviation	0.0047	1030.367	0.0159	8.5705	0.0169	0.8941	0.0212
variance	0	1061656	0.0003	73.4527	0.0003	0.7994	0.0004
Minimum	0.0005	80	0.05	50.5624	0.023	4.7	0.014
Maximum	0.021	8040	0.14	94.2343	0.1	9.5	0.1
Skewness	0.5486	7.2616	-0.0128	0.9557	0.2973	0.8455	0.5161
Kurtosis	3.0471	54.865	3.6554	4.4181	3.6212	4.2183	2.6256

Water Quality Variables	Nitrogen Dissolved	Nitrogen Particulate	Nitrogen Total	Nitrogen Total Kjeldahl	Oxygen Total COD	pH
no.	32	31	47	41	33	61
Average	0.3225	0.1039	0.4349	0.5607	26.2394	7.6854
Median	0.315	0.1	0.42	0.43	27.2	7.7
Standard deviation	0.0558	0.0433	0.0738	0.4931	4.1084	0.5517
variance	0.0031	0.0019	0.0054	0.2431	16.8787	0.3044
Minimum	0.23	0.03	0.3	0.2	18	5.6
Maximum	0.48	0.21	0.7	3.5	36.1	8.96
Skewness	0.8298	0.37	1.0951	5.3381	0.1323	-0.7985
Kurtosis	3.6554	2.6888	5.0482	32.3895	2.6478	5.3383
Water Quality Variables	Phosphorous Particulate	Phosphorous Total	Phosphorous Total Dissolved	Potassium Dissolved	Residue Non-filterable (TSS)	Silica Reactive
no.	39	83	37	83	69	50
Average	0.0139	0.0291	0.0067	1.6284	3.7043	3.7122
Median	0.015	0.025	0.007	1.5	3	3.8
Standard deviation	0.0067	0.0139	0.002	0.7033	3.0789	1.4489
variance	0	0.0002	0	0.4947	9.4795	2.0992
Minimum	0.002	0.007	0.003	1	1	0.3
Maximum	0.028	0.09	0.012	6.8	21	7.2
Skewness	-0.0261	1.2505	0.4031	4.9631	3.3161	-0.0833
Kurtosis	1.9364	5.9454	2.8432	36.6382	17.3799	3.543

Water Quality Variables	Sodium Dissolved	Specific Conductance	Sulphate Dissolved	Water Temperature	Turbidity NTU	pH
no.	83	83	75	62	81	83
Average	6.0035	153.6506	3.1933	11.4268	1.7272	7.7917
Median	6	150	3.2	13.45	1.5	7.8
Standard deviation	0.8195	18.7384	0.744	6.9998	0.9119	0.2128
variance	0.6715	351.1284	0.5536	48.9966	0.8316	0.0453
Minimum	4.5	122	0.6	-0.42	0.5	7.23
Maximum	8.4	207	5.1	21	6.3	8.5
Skewness	0.5572	0.7383	-0.1877	-0.4967	1.8486	-0.0837
Kurtosis	3.6404	3.2437	4.5296	1.8954	9.1445	4.4345

WQV Code	Water Quality Variables	Mann-Kendal trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	1.457	0.145	0.073	0.073	-0.045	0.667	0.765
2	Bicarbonate (CALCD.)	1.409	0.159	0.129	0.129	-0.067	1.004	0.266
3	Calcium Dissolved	0.106	0.916	0.097	0.097	-0.064	0.888	0.409
4	Carbon Dissolved Inorganic	1.556	0.120	0.172	0.172	-0.102	0.941	0.338
5	Carbon Dissolved Organic	2.202	0.028	0.124	0.124	-0.053	1.044	0.225
6	Carbon Particulate Organic	1.245	0.213	0.106	0.079	-0.106	0.652	0.788
7	Chloride Dissolved	0.571	0.568	0.190	0.190	-0.123	1.697	0.006
8	Chlorophyll A	0.564	0.573	0.084	0.084	-0.078	0.705	0.703
9	Conductance	-1.302	0.193	0.503	0.503	-0.415	3.895	0.000
10	Fluoride Dissolved	2.936	0.003	0.147	0.141	-0.147	1.204	0.110
11	Hardness Total CaCO3	0.162	0.871	0.100	0.100	-0.053	0.913	0.376
12	Iron Extractable	-2.283	0.022	0.172	0.172	-0.109	0.957	0.319
13	Magnesium Dissolved	-0.302	0.763	0.138	0.138	-0.079	1.260	0.084
14	Manganese Extractable	0.210	0.834	0.148	0.148	-0.079	0.901	0.391
15	Nitrogen Dissolved	-1.840	0.066	0.127	0.127	-0.075	0.718	0.681
16	Nitrogen Particulate	1.076	0.282	0.117	0.117	-0.084	0.650	0.791
17	Nitrogen Total	-0.148	0.882	0.171	0.171	-0.104	1.175	0.127
18	Nitrogen Total Kjeldahl	-0.754	0.451	0.316	0.316	-0.274	2.021	0.001
19	Oxygen Total COD	0.083	0.934	0.108	0.089	-0.108	0.618	0.840
20	pH	1.335	0.182	0.095	0.079	-0.095	0.741	0.643
21	Phosphorous Particulate	-0.255	0.799	0.110	0.102	-0.110	0.690	0.728
22	Phosphorous Total	3.314	0.001	0.149	0.149	-0.073	1.358	0.050

WQV Code	Water Quality Variables	Mann-Kendal trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
23	Phosphorous Total Dissolved	-0.066	0.947	0.133	0.133	-0.118	0.809	0.529
24	Potassium Dissolved	0.346	0.729	0.263	0.263	-0.186	2.392	0.000
25	Residue Non-filterable (TSS)	2.640	0.008	0.244	0.244	-0.190	2.030	0.001
26	Silica Reactive	-0.436	0.663	0.097	0.093	-0.097	0.683	0.739
27	Sodium Dissolved	1.169	0.243	0.149	0.140	-0.149	1.357	0.050
28	Specific Conductance	0.349	0.727	0.119	0.119	-0.051	1.085	0.190
29	Sulphate Dissolved	-0.647	0.518	0.144	0.096	-0.144	1.248	0.089
30	Water Temperature	-0.190	0.849	0.114	0.114	-0.070	0.701	0.710
31	Turbidity	0.407	0.684	0.150	0.150	-0.132	1.184	0.121
32	pH	1.188	0.235	0.134	0.134	-0.105	1.206	0.109

Sampling site: SK05GD0076 (SASK_14)

Water Quality Variables	Alkalinity Total CaCO3	Bicarbonate	Calcium Dissolved	Carbon Dissolved Organic	Carbonate	Chloride Dissolved	Conductance
no.	37	37	37	32	31	35	30
Average	147.4324	172.0347	47.6564	4.1641	4.5742	5.18	481.16
Median	146	170	47	3.55	4.8	4.4	378.65
Standard deviation	12.9025	20.4015	5.7235	2.2703	4.2785	2.949	443.6462
variance	166.4745	416.2211	32.7579	5.1542	18.306	8.6964	196822
Minimum	129	137	35.2857	2	0	1.9	261
Maximum	190	232	60	13.6	14	14.3	2290
Skewness	0.9325	0.6308	0.1922	2.5697	0.4189	1.9263	3.4796
Kurtosis	4.2708	3.4007	3.1258	10.6519	2.1095	6.335	13.5274
Water Quality Variables	Hardness Total CaCO3	Magnesium Dissolved	Nitrogen Total Kjeldahl	Oxygen Dissolved	pH	Phosphorous Total	Potassium Dissolved
no.	33	33	30	31	30	36	35
Average	185.6667	15.6061	0.4352	10.5203	8.303	0.1082	1.6857
Median	183	15	0.3	9.2	8.32	0.0575	2
Standard deviation	17.6169	1.4564	0.3217	3.6611	0.4945	0.1537	0.796
variance	310.3542	2.1212	0.1035	13.4034	0.2445	0.0236	0.6336
Minimum	151	13	0.2	7.4	6.91	0.02	1
Maximum	228	19	1.2	23.21	9.92	0.8	4
Skewness	0.568	0.4647	1.3686	2.1975	0.4542	3.282	1.3252
Kurtosis	3.0342	2.8096	3.3823	7.7552	6.6444	13.882	4.8303

Water Quality Variables	Residue Fixed non-filterable	Residue non-filterable	Sodium Dissolved	Sulphate Dissolved	Water Temperature	Turbidity	pH
no.	37	37	37	31	34	33	36
Average	44.7973	51.473	12.4923	54.5097	10.6374	26.6421	8.3214
Median	17	20	11.7143	54.9	11.485	7.7	8.35
Standard deviation	86.9634	97.6146	5.4655	7.4544	8.7981	66.8266	0.2675
variance	7562.631	9528.61	29.8713	55.5676	77.407	4465.799	0.0716
Minimum	3	4	5	39.7	0.08	2.8	7.7
Maximum	446	505	38	69.4	23.6	300	8.9
Skewness	3.3418	3.3758	2.9983	-0.3136	0.0039	3.5727	-0.3226
Kurtosis	14.3526	14.6446	14.3224	2.7582	1.3345	14.1608	2.8822

WQV Code	Water Quality Variables	Mann-Kendall trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	-0.774	0.439	0.150	0.150	-0.077	0.913	0.375
2	Bicarbonate	-0.380	0.704	0.122	0.122	-0.067	0.744	0.637
3	Calcium Dissolved	1.549	0.121	0.099	0.083	-0.099	0.604	0.859
4	Carbon Dissolved Organic	-1.039	0.299	0.230	0.230	-0.170	1.301	0.068
5	Carbonate	-1.354	0.176	0.212	0.212	-0.143	1.182	0.122
6	Chloride Dissolved	-0.938	0.348	0.228	0.228	-0.133	1.350	0.052
7	Conductance	0.191	0.848	0.451	0.451	-0.310	2.473	0.000
8	Hardness Total CaCO3	0.171	0.865	0.102	0.102	-0.072	0.586	0.882
9	Magnesium Dissolved	-0.531	0.596	0.207	0.207	-0.157	1.188	0.119
10	Nitrogen Total Kjeldahl	-2.345	0.019	0.296	0.296	-0.232	1.623	0.010
11	Oxygen Dissolved	-0.283	0.777	0.201	0.201	-0.197	1.118	0.164
12	pH	0.893	0.372	0.161	0.161	-0.121	0.880	0.420
13	Phosphorous Total	-1.975	0.048	0.299	0.299	-0.283	1.794	0.003
14	Potassium Dissolved	-1.317	0.188	0.263	0.263	-0.196	1.554	0.016
15	Residue Fixed non-filterable (FSS)	-1.808	0.071	0.351	0.351	-0.315	2.137	0.000
16	Residue Non-filterable (TSS)	-1.821	0.069	0.359	0.359	-0.313	2.183	0.000
17	Sodium Dissolved	-0.818	0.413	0.239	0.239	-0.153	1.451	0.030
18	Sulphate Dissolved	0.816	0.415	0.112	0.088	-0.112	0.626	0.828
19	Water Temperature	0.000	1.000	0.187	0.187	-0.184	1.090	0.186
20	Turbidity	-0.434	0.664	0.424	0.424	-0.361	2.437	0.000
21	pH	-0.637	0.524	0.135	0.113	-0.135	0.809	0.530

Sampling site: SK05GG0102 (SASK_15)

Water Quality Variables	Alkalinity Total CaCO3	Aluminum Total	Barium Total	Bicarbonate	Calcium Dissolved	Calcium Hardness	Calcium Total
no.	183	35	36	103	96	54	31
Average	155.9552	1.6874	0.9257	194.0381	48.1771	119.3926	48.7419
Median	154	0.62	0.08	178	47	115.5	48
Standard deviation	28.1855	2.3232	5.0186	110.962	7.8378	23.192	4.7607
variance	794.425	5.3971	25.1861	12312.56	61.4315	537.8686	22.6645
Minimum	100	0.015	0.03	126.776	27	68	39
Maximum	400	8.8	30.2	1197	78	196	60
Skewness	3.8046	1.7043	5.7466	7.7665	0.5408	0.7478	0.4324
Kurtosis	32.6605	4.8405	34.0251	67.997	4.5034	4.0451	2.8562
Water Quality Variables	Carbon Dissolved Organic	Carbon Total	Carbon Total Inorganic	Carbon Total Organic	Carbonate	Chloride Dissolved	Chlorophyll A
no.	89	73	73	77	74	181	93
Average	7.243	46.9315	33.1644	14.3571	4.5389	15.8116	17.0778
Median	6.5	46	32	13	3.5	13.1	11
Standard deviation	4.2641	9.1868	7.0337	6.688	4.1223	11.1478	18.6714
variance	18.1828	84.398	49.4726	44.7293	16.9935	124.2736	348.6204
Minimum	2	30	16	3	0	2	0.2
Maximum	35.3	83	50	40	19.2	48	84
Skewness	3.4436	1.0038	0.2655	1.4808	1.0571	0.6973	2.1638
Kurtosis	22.3743	5.1567	2.8087	6.2886	3.7809	2.5486	7.3332

Water Quality Variables	Coliforms Fecal	Coliforms Total	Conductance	Copper Total	Fecal Streptococci	Fluoride Dissolved	Hardness Total CaCO3
no.	89	133	141	30	106	33	103
Average	17881.91	26139.85	452.5113	0.004	81.2358	0.1509	189.767
Median	230	2300	409	0.0027	30	0.15	186
Standard deviation	75665.47	83723.77	341.932	0.0039	219.3956	0.0313	27.7139
variance	5.73E+09	7.01E+09	116917.5	0	48134.41	0.001	768.0628
Minimum	10	30	0.413	0.0006	1	0.12	136
Maximum	460000	460000	3460	0.016	2000	0.3	312
Skewness	5.03	4.4903	6.5337	1.811	6.9827	3.4545	0.9643
Kurtosis	28.13	22.6939	53.9052	5.7394	58.1282	16.9822	5.5579
Water Quality Variables	Iron Total	Magnesium Dissolved	Magnesium Hardness	Magnesium Total	Manganese Total	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia
no.	36	96	31	32	37	103	131
Average	1.6181	16.9792	71.1935	16.375	0.06	0.402	0.1944
Median	0.825	16	64	16	0.05	0.4	0.1
Standard deviation	1.9762	3.8987	23.4114	2.5996	0.0499	0.2851	0.2565
variance	3.9053	15.1996	548.0946	6.7581	0.0025	0.0813	0.0658
Minimum	0.1	8	34	12	0.011	0.01	0.01
Maximum	7.76	37	152	23	0.21	1.22	1.58
Skewness	1.728	1.8136	1.6219	0.6989	1.6317	0.6314	2.5723
Kurtosis	5.2458	9.6129	6.1231	3.3791	5.3317	3.0979	10.7328

Water Quality Variables	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved	Oxygen Total COD	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved
no.	178	156	171	148	126	184	94
Average	0.9929	3.4673	9.4301	30.6358	0.0495	0.1451	2.5106
Median	0.7	3	9.25	28.9	0.03	0.11	2
Standard deviation	0.9955	3.5905	2.2395	14.1421	0.065	0.1424	1.334
variance	0.991	12.8916	5.0155	199.9996	0.0042	0.0203	1.7795
Minimum	0.12	0.6	2.3	4	0.003	0.01	1
Maximum	10	42	16.04	89	0.41	1.15	7
Skewness	4.9988	8.161	0.2745	0.9629	3.8256	3.7291	1.1384
Kurtosis	40.765	86.5853	3.7271	4.4722	18.4492	22.4874	4.2496
Water Quality Variables	Potassium Total	Residue Fixed non-filterable (FSS)	Residue non-filterable (TSS)	Residue Volatile non-filtrable (VSS)	Resin Acid Soaps	Sodium Dissolved	Sodium Total
no.	30	178	182	157	34	173	32
Average	2.8333	64.4888	74.0604	9.9299	0.5468	20.5434	15.4125
Median	2.15	24	32	7	0.3	20	15
Standard deviation	3.263	164.2813	171.1717	10.6326	1.049	8.0003	4.3803
variance	10.6471	26988.34	29299.76	113.0528	1.1005	64.0054	19.1869
Minimum	1	3	5	1	0.05	7	7.8
Maximum	19	1922	1992	70	6.3	45	25
Skewness	4.2686	8.7137	8.3863	3.2427	5.0481	0.6106	0.3552
Kurtosis	21.5665	94.5495	89.5354	15.3479	28.2576	2.9081	2.5801

Water Quality Variables	Specific Conductance	Sulphate	Sulphate Dissolved	Sulphide Dissolved	Water Temperature	Total Dissolved Solids	Turbidity	pH
no.	161	94	86	38	174	73	63	183
Average	420.441	54.8511	62.3302	0.2604	10.3155	336.1781	32.9611	8.0922
Median	407	52.5	60.5	0.07	11.1	326	11.6	8.2
Standard deviation	78.1441	12.7591	14.5415	1.0277	8.4562	62.5727	52.6158	0.3851
variance	6106.498	162.7948	211.4553	1.0563	71.5071	3915.343	2768.422	0.1483
Minimum	260	30	35	0.01	-1	235	1.16	6.9
Maximum	745	100	102	6.4	25	607	258	8.96
Skewness	0.6531	0.685	0.5944	5.8322	0.0891	1.7713	2.5385	-0.6551
Kurtosis	4.1373	3.7942	3.2656	35.3525	1.5084	7.808	9.1625	3.3938

WQV Code	Water Quality Variables	Mann-Kendal Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	-0.450	0.653	0.136	0.136	-0.098	1.844	0.002
2	Aluminum Total	-2.728	0.006	0.269	0.269	-0.236	1.590	0.013
3	Barium Total	2.168	0.030	0.530	0.530	-0.429	3.183	0.000
4	Bicarbonate	1.311	0.190	0.345	0.345	-0.275	3.502	0.000
5	Calcium Dissolved	2.524	0.012	0.082	0.082	-0.059	0.803	0.540
6	Calcium Hardness	-0.082	0.935	0.139	0.139	-0.069	1.022	0.247
7	Calcium Total	2.053	0.040	0.175	0.175	-0.095	0.973	0.300
8	Carbon Dissolved Organic	-4.553	0.000	0.149	0.149	-0.137	1.402	0.039
9	Carbon Total	-1.707	0.088	0.096	0.096	-0.049	0.821	0.511
10	Carbon Total Inorganic	-0.819	0.413	0.114	0.114	-0.067	0.974	0.299
11	Carbon Total Organic	-0.578	0.564	0.132	0.132	-0.084	1.156	0.138
12	Carbonate	-0.460	0.646	0.183	0.183	-0.135	1.573	0.014
13	Chloride Dissolved	-4.413	0.000	0.135	0.135	-0.108	1.822	0.003
14	Chlorophyll A	0.878	0.380	0.243	0.243	-0.183	2.344	0.000
15	Coliforms Fecal	-3.347	0.001	0.446	0.446	-0.407	4.211	0.000
16	Coliforms Total	-3.983	0.000	0.412	0.412	-0.378	4.757	0.000
17	Conductance	-1.877	0.061	0.286	0.286	-0.250	3.395	0.000
18	Copper Total	-2.704	0.007	0.270	0.270	-0.190	1.476	0.026
19	Fecal Streptococci	1.050	0.294	0.357	0.334	-0.357	3.679	0.000
20	Fluoride Dissolved	-1.904	0.057	0.264	0.264	-0.191	1.519	0.020
21	Hardness Total CaCO3	1.925	0.054	0.071	0.071	-0.046	0.723	0.673
22	Iron Total	-1.676	0.094	0.253	0.253	-0.221	1.518	0.020
23	Magnesium Dissolved	1.617	0.106	0.168	0.168	-0.102	1.642	0.009
24	Magnesium Hardness	1.416	0.157	0.199	0.199	-0.129	1.110	0.170
25	Magnesium Total	2.141	0.032	0.155	0.155	-0.087	0.877	0.426

WQV Code	Water Quality Variables	Mann-Kendal Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
26	Manganese Total	-1.283	0.200	0.185	0.185	-0.163	1.125	0.159
27	Nitrogen Dissolved NO3 & NO2	0.693	0.488	0.085	0.070	-0.085	0.858	0.453
28	Nitrogen Total Ammonia	-1.722	0.085	0.236	0.233	-0.236	2.702	0.000
29	Nitrogen Total Kjeldahl	-3.774	0.000	0.202	0.199	-0.202	2.690	0.000
30	Oxygen Biochemical Demand	-4.628	0.000	0.239	0.239	-0.233	2.980	0.000
31	Oxygen Dissolved	0.768	0.443	0.084	0.084	-0.063	1.096	0.181
32	Oxygen Total COD	-3.529	0.000	0.094	0.094	-0.062	1.142	0.147
33	Phosphorous Dissolved Ortho	0.305	0.761	0.277	0.277	-0.264	3.109	0.000
34	Phosphorous Total	0.917	0.359	0.208	0.208	-0.184	2.827	0.000
35	Potassium Dissolved	-3.170	0.002	0.266	0.266	-0.138	2.580	0.000
36	Potassium Total	0.161	0.872	0.310	0.310	-0.287	1.697	0.006
37	Residue Fixed non-filterable	-0.087	0.931	0.354	0.300	-0.354	4.724	0.000
38	Residue non-filterable	-0.362	0.718	0.343	0.290	-0.343	4.631	0.000
39	Residue volatile bob-filterable	0.576	0.565	0.236	0.236	-0.215	2.960	0.000
40	Resin Acid Soaps	-0.445	0.656	0.335	0.335	-0.318	1.953	0.001
41	Sodium Dissolved	-4.324	0.000	0.099	0.099	-0.059	1.298	0.069
42	Sodium Total	-0.897	0.370	0.109	0.109	-0.063	0.614	0.845
43	Specific Conductance	-0.419	0.676	0.090	0.090	-0.050	1.137	0.151
44	Sulphate	-0.393	0.694	0.095	0.095	-0.058	0.920	0.365
45	Sulphate Dissolved	0.321	0.749	0.086	0.086	-0.064	0.801	0.542
46	Sulphide Dissolved	-0.529	0.597	0.413	0.413	-0.404	2.544	0.000
47	Water Temperature	0.944	0.345	0.164	0.164	-0.108	2.157	0.000
48	Total Dissolved Solids	-1.424	0.154	0.156	0.156	-0.084	1.335	0.057
49	Turbidity	0.837	0.403	0.323	0.323	-0.273	2.563	0.000
50	pH	3.776	0.000	0.124	0.075	-0.124	1.676	0.007

Sampling site: SK05GG0022 (SASK_16)

Water Quality Variables	Algae at site	Algae in sample	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Aluminum Total	Arsenic Total	Barium Total
no.	58	81	81	228	42	37	42
Average	0.4138	0.321	5.2867	152.2693	2.054	0.8191	0.0943
Median	0	0	5.4	148	0.67	0.7	0.0785
Standard deviation	1.4753	1.2731	3.8481	62.0126	3.0231	0.6966	0.0416
variance	2.1766	1.6207	14.8082	3845.558	9.1391	0.4852	0.0017
Minimum	0	0	0	10	0.025	0.0005	0.03
Maximum	11	11	20	1016	11.2	3.2	0.21
Skewness	6.5352	7.4647	1.0438	11.8747	1.6832	1.7958	1.5331
Kurtosis	47.3327	62.7215	4.8757	166.7419	4.5258	6.6473	4.7811
Water Quality Variables	Beryllium Total	Bicarbonate	Boron Total	Calcium Dissolved	Calcium Hardness	Calcium Total	Carbon Dissolved Organic
no.	34	140	38	141	74	34	134
Average	0.001	175.0814	0.0314	48.4113	126.6838	47.1176	5.2153
Median	0.001	170.83	0.0255	46	116	47	4
Standard deviation	0.0003	38.9937	0.013	18.1872	60.4692	4.1979	4.217
variance	0	1520.512	0.0002	330.7724	3656.521	17.6221	17.7831
Minimum	0.0001	112.148	0.016	15	75	41	2
Maximum	0.002	511.771	0.05	243	608	58	35
Skewness	1.2625	4.8809	0.55	8.7115	6.9427	0.4153	4.535
Kurtosis	11.0832	41.5272	1.5877	94.4742	55.7832	2.7885	29.1747

Water Quality Variables	Carbon Total	Carbon Total Inorganic	Carbon Total Organic	Carbonate	Chloride Dissolved	Chlorophyll A	Coliforms Fecal
no.	75	75	74	97	214	101	159
Average	39.6133	31.8133	8.7973	5.4784	7.6234	18.4568	7639.748
Median	39	31	7.5	4.8	6	12.84	1100
Standard deviation	7.1147	7.5188	5.7647	4.6426	11.0906	15.829	19656.09
variance	50.6187	56.5323	33.2323	21.5534	123.0023	250.5574	3.86E+08
Minimum	21	12	0	0	1	0.7	20
Maximum	70	52	23	24	152	70	150000
Skewness	0.8189	0.2257	0.8028	1.1827	10.5763	1.4086	4.8582
Kurtosis	6.8981	3.7861	2.9916	4.9101	135.9813	4.5183	29.4282
Water Quality Variables	Coliforms Total No/100ml	Coliforms Total MPN/100 ML	Colour	Conductance	Copper Total	Fecal Streptococci	Fluoride Dissolved
no.	182	38	43	132	37	135	37
Average	28158.7	1423.632	12.1163	376.8262	0.004	271.3407	0.15
Median	9300	657	9	370	0.0029	110	0.14
Standard deviation	91307.05	1543.724	12.2459	210.0588	0.0035	369.0347	0.0346
variance	8.34E+09	2383084	149.9623	44124.69	0	136186.6	0.0012
Minimum	30	10	4	0.366	0.0006	10	0.11
Maximum	1100000	5980	69	2270	0.016	1600	0.3
Skewness	9.6161	1.3176	3.4497	5.2589	1.8404	2.0439	2.5811
Kurtosis	108.3881	3.7378	15.1307	51.5575	6.3796	6.5886	11.1509

Water Quality Variables	Hardness Total CaCO3	Iron Total	Magnesium Dissolved	Magnesium Total	Manganese Total	Nickel Total	Nitrogen Dissolved NO3 & NO2
no.	146	43	141	33	43	34	133
Average	189.0274	1.7446	16.5177	15.2424	0.0607	0.005	0.4276
Median	180.5	0.7	15	15	0.044	0.0034	0.4
Standard deviation	84.3666	2.3431	10.262	1.8033	0.0615	0.006	0.3632
variance	7117.723	5.4903	105.3086	3.2519	0.0038	0	0.1319
Minimum	108	0.078	11	12	0.004	0.0009	0.014
Maximum	1161	8.66	134	19	0.3	0.034	3.22
Skewness	10.5731	1.7356	10.754	0.1182	2.0508	3.5394	3.6626
Kurtosis	122.3572	4.7594	123.5879	2.3039	7.3805	17.5461	27.6465
Water Quality Variables	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved (field)	Oxygen Dissolved	Oxygen Total COD	Phosphorous Dissolved Ortho
no.	160	233	199	75	101	77	152
Average	0.2298	0.9159	2.6417	9.652	9.6851	20.7571	0.0492
Median	0.1	0.7	2	9.5	9.5	16	0.03
Standard deviation	0.3542	1.1574	2.7531	1.937	2.5132	16.6734	0.0721
variance	0.1254	1.3397	7.5796	3.7519	6.3161	278.003	0.0052
Minimum	0.01	0.1	0	5.1	1.5	4	0.01
Maximum	3.5	11	29.6	17.45	15.3	133	0.55
Skewness	5.4624	5.95	5.9631	1.1248	0.1048	4.3872	4.9865
Kurtosis	47.2919	45.3262	52.5602	6.1247	3.2796	28.4036	30.6585

Water Quality Variables	Phosphorous Total	Potassium Dissolved	Potassium Total	Residue Fixed non-filterable	Residue non-filterable	Residue volatile non-filterable	Sodium Dissolved
no.	238	118	29	224	235	199	172
Average	0.151	2.1864	2.9414	55.5446	63.2128	8.7638	14.4593
Median	0.1	2	1.8	24	28	5	13
Standard deviation	0.2073	1.6432	5.6184	107.5827	118.1425	13.2192	7.852
variance	0.043	2.7	31.5661	11574.04	13957.65	174.747	61.6533
Minimum	0.01	1	0.7	2	4	1	5
Maximum	1.99	16	32	930	1056	126	93
Skewness	5.461	5.3525	5.0169	4.7828	4.8639	5.1738	6.0705
Kurtosis	40.4272	43.849	26.4726	31.4818	33.0478	38.3827	59.5336
Water Quality Variables	Sodium Total	Specific Conductance	Sulphate	Sulphate Dissolved	Water Temperature	Titanium Total	Total Dissolved Solids
no.	34	216	106	71	171	38	115
Average	12.5588	411.5787	54.9623	63.3239	10.691	0.0366	330.0435
Median	12	391	51	60	12	0.0095	310
Standard deviation	3.7582	222.8952	33.7407	23.9142	8.5817	0.0513	175.9474
variance	14.1237	49682.27	1138.437	571.8878	73.6464	0.0026	30957.48
Minimum	6.8	36	29	11	-1	0.001	233
Maximum	22	2980	380	180	27.4	0.17	2129
Skewness	0.5618	8.8484	8.5359	2.0813	0.0142	1.4671	9.4164
Kurtosis	3.0325	93.9861	82.841	10.7489	1.5424	3.7895	96.7211

Water Quality Variables	TURBIDITY - 2074 - NTU	pH - 10301 - PH UNITS
no.	70	237
Average	31.9077	8.1573
Median	12.5	8.2
Standard deviation	52.9641	0.35
variance	2805.197	0.1225
Minimum	0.7	6.2
Maximum	283	9
Skewness	3.015	-1.0059
Kurtosis	12.7003	6.6683

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Algae at site	-0.091	0.928	0.390	0.369	-0.390	2.967	0.000
2	Algae in sample	-0.400	0.689	0.414	0.414	-0.400	3.729	0.000
3	Alkalinity Phenolphthalein	-3.156	0.002	0.155	0.155	-0.085	1.394	0.041
4	Alkalinity Total CaCO3	-0.395	0.693	0.274	0.274	-0.251	4.142	0.000
5	Aluminum Total	-1.380	0.168	0.278	0.278	-0.251	1.803	0.003
6	Arsenic Total	0.973	0.331	0.183	0.183	-0.120	1.116	0.166
7	Barium Total	1.352	0.176	0.231	0.231	-0.162	1.497	0.023
8	Beryllium Total	-2.005	0.045	0.486	0.486	-0.426	2.831	0.000
9	Bicarbonate	0.915	0.360	0.160	0.160	-0.122	1.894	0.002
10	Boron Total	-1.132	0.257	0.214	0.214	-0.212	1.318	0.062
11	Calcium Dissolved	1.432	0.152	0.259	0.259	-0.231	3.079	0.000
12	Calcium Hardness	0.991	0.322	0.264	0.264	-0.243	2.273	0.000
13	Calcium Total	1.925	0.054	0.099	0.099	-0.077	0.580	0.890
14	Carbon Dissolved Organic	-0.409	0.682	0.223	0.214	-0.223	2.580	0.000
15	Carbon Total	-0.321	0.748	0.117	0.117	-0.083	1.014	0.256
16	Carbon Total Inorganic	-0.454	0.650	0.100	0.090	-0.100	0.864	0.445
17	Carbon Total Organic	1.250	0.211	0.134	0.134	-0.065	1.149	0.143
18	Carbonate	-1.099	0.272	0.131	0.131	-0.119	1.289	0.072
19	Chloride Dissolved	-4.800	0.000	0.297	0.253	-0.297	4.341	0.000
20	Chlorophyll A	1.131	0.258	0.176	0.176	-0.139	1.764	0.004
21	Coliforms Fecal	-1.684	0.092	0.349	0.329	-0.349	4.402	0.000
22	Coliforms Total NO/100ML	-3.348	0.001	0.379	0.321	-0.379	5.113	0.000
23	Coliforms Total MPN/100 ML	-0.490	0.624	0.258	0.258	-0.180	1.590	0.013
24	Colour	-0.612	0.541	0.291	0.291	-0.257	1.906	0.001

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
25	Conductance	-0.953	0.341	0.218	0.166	-0.218	2.504	0.000
26	Copper Total	-1.668	0.095	0.232	0.232	-0.166	1.412	0.037
27	Fecal Streptococci	-3.039	0.002	0.239	0.227	-0.239	2.782	0.000
28	Fluoride Dissolved	-1.899	0.058	0.230	0.230	-0.166	1.397	0.040
29	Hardness Total CaCO3	1.312	0.190	0.311	0.311	-0.280	3.752	0.000
30	Iron Total	-0.806	0.421	0.276	0.276	-0.238	1.809	0.003
31	Magnesium Dissolved	0.611	0.541	0.334	0.334	-0.316	3.960	0.000
32	Magnesium Total	3.209	0.001	0.160	0.160	-0.113	0.916	0.370
33	Manganese Total	0.162	0.871	0.258	0.258	-0.178	1.692	0.007
34	Nickel Total	-1.808	0.071	0.245	0.215	-0.245	1.428	0.034
35	Nitrogen Dissolved NO3 & NO2	0.117	0.907	0.127	0.120	-0.127	1.469	0.027
36	Nitrogen Total Ammonia	-2.933	0.003	0.267	0.176	-0.267	3.383	0.000
37	Nitrogen Total Kjeldahl	-6.462	0.000	0.260	0.249	-0.260	3.962	0.000
38	Oxygen Biochemical Demand	-1.070	0.285	0.196	0.192	-0.196	2.772	0.000
39	Oxygen Dissolved (field)	0.174	0.862	0.122	0.122	-0.117	1.056	0.215
40	Oxygen Dissolved	-0.438	0.661	0.102	0.102	-0.081	1.025	0.244
41	Oxygen Total COD	-0.097	0.923	0.222	0.222	-0.201	1.946	0.001
42	Phosphorous Dissolved Ortho	-0.499	0.618	0.294	0.275	-0.294	3.619	0.000
43	Phosphorous Total	0.485	0.627	0.274	0.274	-0.259	4.234	0.000
44	Potassium Dissolved	-3.261	0.001	0.282	0.282	-0.235	3.068	0.000
45	Potassium Total	-0.698	0.485	0.447	0.447	-0.345	2.408	0.000
46	Residue Fixed non-filterable	1.157	0.247	0.309	0.286	-0.309	4.630	0.000
47	Residue non-filterable	0.523	0.601	0.308	0.277	-0.308	4.723	0.000
48	Residue Volatile non-filterable	1.722	0.085	0.278	0.257	-0.278	3.929	0.000
49	Sodium Dissolved	-2.702	0.007	0.164	0.164	-0.159	2.149	0.000
50	Sodium Total	2.012	0.044	0.100	0.100	-0.074	0.585	0.883

WQV code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
51	Specific Conductance	1.640	0.101	0.300	0.300	-0.281	4.402	0.000
52	Sulphate	-0.457	0.648	0.271	0.271	-0.232	2.793	0.000
53	Sulphate Dissolved	0.268	0.789	0.207	0.207	-0.102	1.744	0.005
54	Water Temperature	0.958	0.338	0.168	0.168	-0.104	2.195	0.000
55	Titanium Total	-1.369	0.171	0.268	0.268	-0.244	1.655	0.008
56	Total Dissolved Solids	-0.890	0.374	0.297	0.296	-0.297	3.185	0.000
57	Turbidity	2.150	0.032	0.308	0.308	-0.278	2.574	0.000
58	pH	2.455	0.014	0.122	0.067	-0.122	1.885	0.002

Sampling site: SK05EG0090 (SASK_17)

Water Quality Variables	Alkalinity Total CaCO3	Bicarbonate	Calcium Dissolved	Calcium Hardness	Carbon Dissolved Organic	Carbonate	Chloride Dissolved
no.	119	85	95	46	88	55	98
Average	143.637	165.9548	46.9684	115.7609	4.3493	6.1295	6.1929
Median	140	163	46	114	3.85	5.76	4
Standard deviation	24.0579	32.9916	7.2778	17.4893	3.3811	4.9393	5.1477
variance	578.783	1088.447	52.9671	305.8749	11.432	24.3969	26.499
Minimum	99	69	31	78	1	0	1
Maximum	315	346	82	152	30.1	25	38.6
Skewness	3.5187	2.1929	1.3475	-0.0656	5.3245	1.4318	3.1076
Kurtosis	24.0428	13.5586	8.0769	2.7319	39.8694	5.9795	17.7403
Water Quality Variables	Chlorophyll A	Coliforms Fecal	Coliforms Total	Conductance	Fecal Streptococci	Hardness Total CaCO3	Magnesium Dissolved
no.	35	68	88	37	44	94	94
Average	13.8134	96.75	704.25	552.5351	53.75	179.2872	15.1702
Median	6.38	40	122	361	20	176	15
Standard deviation	15.142	176.9329	1639.554	751.0925	97.1123	24.8642	3.235
variance	229.2792	31305.26	2688138	564140	9430.797	618.2284	10.4653
Minimum	0.47	0	0	251	1	144	8
Maximum	62.5	930	10000	4600	590	304	36
Skewness	1.6382	3.2896	4.1277	4.67	4.1441	1.8395	3.0936
Kurtosis	5.019	13.9719	21.6052	24.6959	22.5072	9.0813	20.5966

Water Quality Variables	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved
no.	74	78	107	101	72	109	68
Average	0.416	0.2107	0.9107	1.8703	0.0544	0.1406	1.725
Median	0.41	0.14	0.7	1.6	0.045	0.1	1
Standard deviation	0.2746	0.2347	1.0748	1.3837	0.0341	0.1395	1.4127
variance	0.0754	0.0551	1.1552	1.9145	0.0012	0.0195	1.9956
Minimum	0.02	0.01	0.1	0.1	0.01	0.02	1
Maximum	1.01	1.07	7.5	7.5	0.15	0.8	9
Skewness	0.3735	1.7238	4.6323	1.3331	0.892	2.9041	3.5682
Kurtosis	2.3078	5.8297	27.5696	4.9146	3.0556	12.5511	16.6047
Water Quality Variables	Residue Fixed non-filterable	Residue non-filterable	Residue Volatile Non-filterable	Sodium Dissolved	Specific Conductance	Sulphate	Water temperature
no.	116	117	97	97	101	75	46
Average	38.5	44.1111	6.0825	11.9691	358.8416	46.4667	9.8915
Median	12	16	3	9	350	47	11.15
Standard deviation	69.0441	74.9977	7.0099	18.1679	59.2948	9.4072	8.3807
variance	4767.087	5624.651	49.139	330.072	3515.875	88.4955	70.2354
Minimum	1	2	1	3	210	24	0
Maximum	435	467	35	172	600	82	23.1
Skewness	3.3411	3.261	2.2574	7.6985	0.9683	0.2216	0.0698
Kurtosis	15.3009	14.6137	7.9658	65.4374	5.6847	4.8333	1.4251

Water Quality Variables	Total Dissolved Solids	pH
no.	76	119
Average	291.3158	8.1646
Median	286	8.2
Standard deviation	36.9775	0.3757
variance	1367.339	0.1411
Minimum	198	6.9
Maximum	443	8.9
Skewness	0.962	-0.4292
Kurtosis	5.7601	2.9053

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	0.490	0.624	0.158	0.158	-0.140	1.719	0.005
2	Bicarbonate	2.498	0.013	0.168	0.168	-0.131	1.553	0.016
3	Calcium Dissolved	0.838	0.402	0.128	0.128	-0.100	1.247	0.089
4	Calcium Hardness	0.968	0.333	0.082	0.082	-0.072	0.553	0.920
5	Carbon Dissolved Organic	-0.084	0.934	0.223	0.223	-0.221	2.090	0.000
6	Carbonate	-2.001	0.045	0.196	0.196	-0.107	1.454	0.029
7	Chloride Dissolved	-3.018	0.003	0.201	0.201	-0.182	1.991	0.001
8	Chlorophyll A	-0.683	0.495	0.203	0.203	-0.189	1.198	0.113
9	Coliforms Fecal	-0.135	0.893	0.324	0.324	-0.292	2.672	0.000
10	Coliforms Total	0.101	0.919	0.339	0.339	-0.334	3.181	0.000
11	Conductance	-0.105	0.917	0.377	0.377	-0.344	2.295	0.000
12	Fecal Streptococci	1.132	0.258	0.294	0.280	-0.294	1.947	0.001
13	Hardness Total CaCO3	1.886	0.059	0.129	0.129	-0.078	1.250	0.088
14	Magnesium Dissolved	0.822	0.411	0.207	0.207	-0.166	2.010	0.001
15	Nitrogen Dissolved NO3 & NO2	-0.005	0.996	0.075	0.073	-0.075	0.642	0.804
16	Nitrogen Total Ammonia	0.050	0.960	0.196	0.179	-0.196	1.733	0.005
17	Nitrogen Total Kjeldahl	-4.812	0.000	0.282	0.282	-0.245	2.914	0.000
18	Oxygen Biochemical Demand	-0.556	0.578	0.142	0.142	-0.104	1.425	0.034
19	Phosphorous Dissolved Ortho	-0.049	0.961	0.164	0.164	-0.096	1.392	0.041
20	Phosphorous Total	-5.803	0.000	0.225	0.225	-0.194	2.345	0.000
21	Potassium Dissolved	-2.067	0.039	0.335	0.335	-0.304	2.759	0.000

WQV code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
22	Residue Fixed non-filterable	-2.040	0.041	0.305	0.305	-0.294	3.282	0.000
23	Residue non-filterable	-2.283	0.023	0.303	0.303	-0.287	3.276	0.000
24	Residue volatile non-filterable	-1.987	0.047	0.237	0.237	-0.234	2.331	0.000
25	Sodium Dissolved	0.091	0.927	0.385	0.385	-0.320	3.788	0.000
26	Specific Conductance	2.460	0.014	0.096	0.096	-0.088	0.966	0.309
27	Sulphate	1.073	0.283	0.094	0.075	-0.094	0.810	0.528
28	Water Temperature	1.318	0.187	0.198	0.198	-0.119	1.343	0.054
29	Total Dissolved Solids	-0.301	0.764	0.129	0.129	-0.085	1.124	0.160
30	pH	1.170	0.242	0.111	0.064	-0.111	1.214	0.105

Sampling site: SK05JG0126 (SASK_18)

Water Quality Variables	Alkalinity Total CaCO3	Aluminum Total	Arsenic Total	Barium Total	Bicarbonate	Calcium Dissolved	Calcium Hardness
no.	231	38	38	42	154	137	88
Average	168.2926	0.5926	2.0316	3.7754	185.141	46.2263	119.2977
Median	162	0.21	1.45	0.0775	185	46	117.5
Standard deviation	39.5705	0.8529	1.3983	16.8282	45.4063	10.2211	26.1959
variance	1565.822	0.7274	1.9552	283.1873	2061.736	104.4705	686.2262
Minimum	71.782	0.017	0.6	0.036	88	18	46
Maximum	450	3.9	6.5	85.9	291	69	172
Skewness	1.7891	2.3856	1.6063	4.3294	0.1972	-0.0979	-0.1659
Kurtosis	13.019	8.6003	4.9977	19.9878	2.5963	2.8491	2.8283
Water Quality Variables	Calcium Total	Carbon Dissolved Organic	Carbon Total	Carbon Total Inorganic	Carbon Total Organic	Carbonate	Chloride Dissolved
no.	31	164	52	52	56	111	230
Average	43.871	5.3482	45.1538	36.0385	9.9286	8.0047	11.3683
Median	43	5	44	34.5	9	5	10
Standard deviation	9.7766	1.8065	9.3145	10.0761	5.0447	8.4885	5.5094
variance	95.5828	3.2633	86.7602	101.5279	25.4494	72.0544	30.3531
Minimum	25	2	31	22	0	0	2
Maximum	66	12	67	62	24	38.4	40
Skewness	0.7189	1.216	0.4411	0.6593	0.6991	1.5474	1.6625
Kurtosis	3.1672	4.9069	2.2459	2.5083	3.3386	5.1824	7.9228

Water Quality Variables	Chlorophyll A	Coliforms Fecal	Coliforms Total	Conductance	Fecal Streptococci	Hardness Total CaCO3	Iron Total
no.	107	90	159	204	106	138	40
Average	17.7044	29.4222	546.5597	502.8436	146.8113	196.2899	0.7372
Median	11	10	90	490	20	192	0.26
Standard deviation	23.873	113.148	1970.135	108.5995	629.7222	35.4889	1.4948
variance	569.9214	12802.47	3881431	11793.86	396550.1	1259.463	2.2344
Minimum	1.4	0	0	231	2	89	0.046
Maximum	134.04	1000	19863	850	6200	280	9.2
Skewness	3.1496	7.5088	7.4938	0.3007	8.6806	0.0104	4.757
Kurtosis	13.2063	62.712	66.7695	3.1574	82.5483	3.2378	27.1224
Water Quality Variables	Magnesium Dissolved	Magnesium Total	Manganese Total	Nickel Total	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl
no.	136	33	41	35	113	188	236
Average	19.625	18.7758	0.0403	0.0031	0.2402	0.1229	0.8624
Median	19	19	0.028	0.002	0.07	0.07	0.7
Standard deviation	3.5734	3.565	0.0367	0.0023	0.7322	0.18	0.6318
variance	12.7694	12.7094	0.0013	0	0.5361	0.0324	0.3992
Minimum	9	9.6	0.007	0.001	0.007	0.01	0.1
Maximum	30	26	0.18	0.012	6.7	1.25	6.4
Skewness	0.0459	-0.0901	2.2459	2.1359	6.9472	3.433	4.3297
Kurtosis	3.4213	3.056	8.0472	8.1498	57.3248	15.8248	32.0315

Water Quality Variables	Oxygen Biochemical Demand	Oxygen Dissolved	Oxygen Dissolved (field)	pH	pH (FIELD)	Phosphorous Dissolved Ortho	Phosphorous Total
no.	215	135	91	231	198	177	233
Average	1.9916	10.9941	10.922	8.2607	8.2885	0.0514	0.1009
Median	1.5	11.1	10.1	8.3	8.3	0.03	0.07
Standard deviation	1.4753	3.1951	4.4911	0.3615	0.528	0.0481	0.0936
variance	2.1765	10.2088	20.1696	0.1307	0.2788	0.0023	0.0088
Minimum	0.1	2.2	2.36	7.1	6	0.01	0.01
Maximum	8.5	18	32.03	9.3	10.4	0.3	0.97
Skewness	2.1583	-0.4703	2.5441	0.1726	-0.1793	2.21	4.3522
Kurtosis	8.4454	3.2982	11.2726	3.8818	6.4897	8.8464	35.2744
Water Quality Variables	Potassium Dissolved	Potassium Total	Residue Fixed non-filterable	Residue non-filterable	Residue Volatile non-filterable	Sodium Dissolved	Sodium Total
no.	132	33	228	232	229	138	33
Average	3.6644	3.8961	12.1096	15.7802	3.8777	35.6087	33.6364
Median	3	3.9	6	9	3	33	32
Standard deviation	1.4664	1.6572	24.6017	27.9435	4.1446	12.0984	8.9016
variance	2.1502	2.7464	605.2434	780.8389	17.178	146.3713	79.2386
Minimum	2	0.27	1	1	1	20	21
Maximum	10	7.6	327	370	43	102	57
Skewness	2.1174	-0.2717	9.6573	9.2751	4.9037	2.427	0.7916
Kurtosis	8.6836	3.2503	119.8888	113.5212	39.4157	11.6477	3.0081

Water Quality Variables	Specific Conductance	Sulphate	Water Temperature	Titanium Total	Total Dissolved Solids	Turbidity
no.	214	117	229	36	115	41
Average	504.8411	86.6496	9.1362	0.0131	400.1478	9.5402
Median	490	82	6.97	0.005	387	6.1
Standard deviation	102.4295	24.4291	7.9056	0.0193	77.7413	11.159
variance	10491.8	596.7813	62.4991	0.0004	6043.706	124.5223
Minimum	304	54	-0.07	0.001	230	0.8
Maximum	884	204	25	0.09	680	64.9
Skewness	0.8471	2.3041	0.3219	2.5406	0.5263	3.4253
Kurtosis	3.9349	10.8796	1.5349	9.21	3.4355	16.3967

WQV Code	Water Quality Variables	Mann-Kendall Trend Test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	0.078	0.938	0.122	0.122	-0.059	1.859	0.002
2	Aluminum Total	-3.019	0.003	0.250	0.243	-0.250	1.540	0.017
3	Arsenic Total	0.788	0.431	0.226	0.226	-0.153	1.396	0.041
4	Barium Total	0.716	0.474	0.537	0.537	-0.412	3.483	0.000
5	Bicarbonate	1.957	0.050	0.047	0.047	-0.044	0.584	0.884
6	Calcium Dissolved	-0.783	0.434	0.065	0.065	-0.051	0.756	0.617
7	Calcium Hardness	0.229	0.819	0.069	0.069	-0.065	0.646	0.798
8	Calcium Total	0.409	0.683	0.196	0.196	-0.092	1.091	0.185
9	Carbon Dissolved Organic	3.188	0.001	0.150	0.150	-0.136	1.916	0.001
10	Carbon Total	-1.835	0.067	0.098	0.098	-0.069	0.705	0.703
11	Carbon Total Inorganic	-1.660	0.097	0.117	0.117	-0.090	0.846	0.472
12	Carbon Total Organic	0.490	0.624	0.137	0.137	-0.093	1.027	0.242
13	Carbonate	-1.169	0.243	0.173	0.160	-0.173	1.821	0.003
14	Chloride Dissolved	-1.622	0.105	0.146	0.146	-0.078	2.209	0.000
15	Chlorophyll A	-1.436	0.151	0.279	0.279	-0.247	2.887	0.000
16	Coliforms Fecal	0.634	0.526	0.397	0.389	-0.397	3.770	0.000
17	Coliforms Total	1.637	0.102	0.391	0.357	-0.391	4.927	0.000
18	Conductance	-0.314	0.753	0.062	0.062	-0.031	0.880	0.421
19	Fecal Streptococci	0.834	0.404	0.409	0.357	-0.409	4.212	0.000
20	Hardness Total CaCO3	0.171	0.864	0.059	0.059	-0.038	0.694	0.720
21	Iron Total	-2.087	0.037	0.322	0.279	-0.322	2.036	0.001
22	Magnesium Dissolved	1.646	0.100	0.105	0.105	-0.082	1.228	0.098
23	Magnesium Total	2.466	0.014	0.111	0.111	-0.111	0.639	0.808
24	Manganese Total	1.540	0.124	0.238	0.238	-0.182	1.523	0.019

WQV Code	Water Quality Variables	Mann-Kendall Trend Test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
25	Nickel Total	-2.944	0.003	0.233	0.233	-0.176	1.378	0.045
26	Nitrogen Dissolved NO3 & NO2	0.580	0.562	0.375	0.365	-0.375	3.987	0.000
27	Nitrogen Total Ammonia	-1.798	0.072	0.288	0.288	-0.265	3.953	0.000
28	Nitrogen Total Kjeldahl	-4.700	0.000	0.206	0.206	-0.174	3.167	0.000
29	Oxygen Biochemical Demand	-1.596	0.110	0.181	0.181	-0.154	2.660	0.000
30	Oxygen Dissolved	0.472	0.637	0.059	0.046	-0.059	0.689	0.729
31	Oxygen Dissolved (field)	0.292	0.771	0.199	0.199	-0.146	1.902	0.001
32	pH	0.822	0.411	0.121	0.121	-0.078	1.833	0.002
33	pH (FIELD)	-0.956	0.339	0.085	0.070	-0.085	1.201	0.112
34	Phosphorous Dissolved Ortho	-1.606	0.108	0.229	0.229	-0.195	3.043	0.000
35	Phosphorous Total	-2.138	0.033	0.199	0.199	-0.181	3.039	0.000
36	Potassium Dissolved	1.505	0.132	0.258	0.258	-0.181	2.964	0.000
37	Potassium Total	0.932	0.351	0.126	0.108	-0.126	0.724	0.671
38	Residue Fixed non-filterable	0.796	0.426	0.326	0.241	-0.326	4.919	0.000
39	Residue non-filterable	0.659	0.510	0.307	0.234	-0.307	4.671	0.000
40	Residue Volatile non-filterable	-0.128	0.899	0.244	0.244	-0.244	3.688	0.000
41	Sodium Dissolved	2.433	0.015	0.148	0.148	-0.118	1.741	0.005
42	Sodium Total	1.499	0.134	0.135	0.135	-0.085	0.773	0.589
43	Specific Conductance	-0.313	0.755	0.106	0.106	-0.068	1.552	0.016
44	Sulphate	1.587	0.113	0.128	0.128	-0.104	1.379	0.044
45	Water Temperature	0.031	0.975	0.170	0.170	-0.122	2.573	0.000
46	Titanium Total	-2.634	0.008	0.265	0.264	-0.265	1.588	0.013
47	Total Dissolved Solids	0.525	0.600	0.087	0.087	-0.066	0.932	0.350
48	Turbidity	1.502	0.133	0.260	0.260	-0.217	1.668	0.008

Sampling site: SK05HH0267 (SASK_19)

Water Quality Variables	Alkalinity Total CaCO3	Barium Total	Bicarbonate	Calcium Dissolved	Calcium Hardness	Carbon Dissolved Organic	Carbon Total
no.	254	30	145	168	104	180	60
Average	157.4446	0.0868	184.8855	46.2857	114.7808	4.2441	39.2
Median	156	0.087	186.507	46	116	4	37.5
Standard deviation	33.4283	0.0071	13.6975	4.0047	15.1637	1.2078	15.9191
variance	1117.451	0	187.622	16.0376	229.9375	1.4588	253.4169
Minimum	116	0.072	131.652	23	15	1	21
Maximum	669	0.1	222	61	152	13.3	154
Skewness	14.1712	0.0478	-0.8151	-0.8165	-3.0513	3.2662	6.3814
Kurtosis	217.6511	2.8787	4.924	10.3629	21.3112	24.4249	46.7061
Water Quality Variables	Carbon Total Inorganic	Carbon Total Organic	Carbonate	Chloride Dissolved	Chlorophyll A	Chromium Total	Coliforms Fecal
no.	60	60	82	249	81	97	177
Average	31.2833	6.1	6.102	7.9775	6.7707	0.0063	5524.644
Median	32	5.5	5.5	8	4.98	0.005	160
Standard deviation	4.1378	4.8737	4.8687	3.6449	12.5631	0.0053	36817.82
variance	17.1218	23.7525	23.7039	13.285	157.8313	0	1.36E+09
Minimum	18	0	0	2	0	0.0001	8
Maximum	39	26	26.4	22	111	0.041	460000
Skewness	-0.8533	1.6769	1.4035	0.8714	7.2654	3.2801	10.9981
Kurtosis	3.8954	7.0416	6.1938	4.2728	60.1566	19.8583	133.4304

Water Quality Variables	Coliforms Total	Conductance	Fecal Streptococci	Fluoride Dissolved	Hardness Total CaCO3	Iron Total	Magnesium Dissolved
no.	237	208	197	30	171	30	167
Average	8958.367	429.3616	225.9492	0.1583	189.4503	0.222	17.8094
Median	1000	429.5	110	0.16	190	0.14	17
Standard deviation	37364.26	80.9369	297.3492	0.0156	11.3154	0.2257	2.9797
variance	1.4E+09	6550.787	88416.54	0.0002	128.0372	0.051	8.8786
Minimum	10	2.52	1	0.12	155	0.023	0.17
Maximum	460000	750	1680	0.19	229	0.82	32
Skewness	8.9822	-0.0775	2.2975	-0.6689	0.3721	1.5968	-0.1211
Kurtosis	98.2056	8.1679	9.0859	3.6526	3.4509	4.4858	12.9662
Water Quality Variables	Magnesium Hardness	Manganese Total	Mercury Total	Nitrogen Dissolved Nitrate	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl
no.	33	30	41	38	217	215	254
Average	73.697	0.0189	0.4198	0.2389	0.2464	0.1977	0.7303
Median	72	0.016	0.04	0.25	0.17	0.16	0.6
Standard deviation	13.1541	0.011	1.8642	0.0632	0.4586	0.1562	0.4582
variance	173.0303	0.0001	3.4751	0.004	0.2103	0.0244	0.21
Minimum	48	0.002	0.02	0.08	0.022	0.01	0.1
Maximum	112	0.051	12	0.35	6.1	0.84	3.3
Skewness	0.7469	1.0968	6.0624	-0.3092	10.7092	1.6808	2.4095
Kurtosis	3.9572	3.858	38.1612	2.5354	129.9312	5.8509	12.1935

Water Quality Variables	Oxygen Biochemical Demand	Oxygen Dissolved	Oxygen Total COD	pH (FIELD)	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved
no.	212	232	107	199	170	241	167
Average	1.5802	11.128	14.8701	8.3157	0.0546	0.0945	3.0617
Median	1.4	11	12.6	8.4	0.04	0.08	3
Standard deviation	0.8441	2.9108	6.5273	0.4428	0.0669	0.0837	0.817
variance	0.7125	8.4727	42.6063	0.196	0.0045	0.007	0.6676
Minimum	0.4	3.9	3	5.8	0.003	0.02	2
Maximum	6	30.42	44	10.3	0.8	0.8	7
Skewness	1.428	2.1243	1.7219	-0.6882	8.4069	4.1122	1.6869
Kurtosis	6.4938	15.2726	8.0247	10.4861	92.4262	29.104	8.9619
Water Quality Variables	Residue Fixed non-filterable	Residue non-filterable	Residue Volatile non-filterable	Sodium Dissolved	Specific Conductance	Sulphate	Sulphate Dissolved
no.	246	254	225	226	256	135	48
Average	19.7195	22.7795	3.3644	23.208	432.5703	66.2444	88.5188
Median	9	11	2	23	432.5	66	71.95
Standard deviation	55.6016	59.9804	4.6156	3.9985	45.3091	9.9074	97.3807
variance	3091.541	3597.643	21.3041	15.9877	2052.913	98.1562	9483.009
Minimum	1	1	1	15	270	41	60.3
Maximum	649	687	46	48	560	88	746
Skewness	8.4951	8.1421	6.4775	1.1766	-0.5536	-0.019	6.6112
Kurtosis	84.1398	77.5336	51.587	8.3848	4.2088	2.3362	45.1545

Water Quality Variables	Water Temperature	Total Dissolved Solids	Turbidity	pH
no.	244	146	48	256
Average	9.2416	355.7603	5.1354	8.2039
Median	8.2	359	3.35	8.2
Standard deviation	8.3039	21.5004	3.6365	0.2774
variance	68.955	462.2663	13.2242	0.077
Minimum	0	298	1.33	6.8
Maximum	27	405	17.52	9
Skewness	0.259	-0.1598	1.3902	-1.1644
Kurtosis	1.5743	2.5475	4.5116	7.378

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	7.386	0.000	0.329	0.329	-0.279	5.241	0.000
2	Barium Total	1.451	0.147	0.121	0.121	-0.080	0.661	0.775
3	Bicarbonate	3.034	0.002	0.073	0.052	-0.073	0.881	0.420
4	Calcium Dissolved	1.165	0.244	0.126	0.126	-0.112	1.633	0.010
5	Calcium Hardness	-0.217	0.828	0.193	0.137	-0.193	1.966	0.001
6	Carbon Dissolved Organic	3.873	0.000	0.202	0.202	-0.198	2.714	0.000
7	Carbon Total	-0.615	0.539	0.347	0.347	-0.270	2.687	0.000
8	Carbon Total Inorganic	-1.390	0.164	0.139	0.067	-0.139	1.080	0.194
9	Carbon Total Organic	0.731	0.465	0.158	0.158	-0.105	1.225	0.099
10	Carbonate	-1.194	0.233	0.130	0.130	-0.105	1.180	0.124
11	Chloride Dissolved	2.864	0.004	0.116	0.116	-0.089	1.831	0.002
12	Chlorophyll A	-1.951	0.051	0.296	0.294	-0.296	2.661	0.000
13	Chromium Total	-1.052	0.293	0.204	0.204	-0.168	2.012	0.001
14	Coliforms Fecal	-6.678	0.000	0.460	0.460	-0.440	6.125	0.000
15	Coliforms Total	-7.025	0.000	0.405	0.392	-0.405	6.240	0.000
16	Conductance	-1.303	0.193	0.083	0.083	-0.075	1.198	0.113
17	Fecal Streptococci	-1.758	0.079	0.225	0.195	-0.225	3.153	0.000
18	Fluoride Dissolved	-2.849	0.004	0.173	0.160	-0.173	0.950	0.328
19	Hardness Total CaCO3	-0.356	0.722	0.065	0.065	-0.039	0.851	0.463
20	Iron Total	-1.964	0.050	0.224	0.224	-0.189	1.229	0.098
21	Magnesium Dissolved	0.493	0.622	0.193	0.193	-0.164	2.495	0.000
22	Magnesium Hardness	-1.748	0.081	0.188	0.188	-0.109	1.078	0.195
23	Manganese Total	-0.912	0.362	0.196	0.196	-0.118	1.076	0.197
24	Mercury Total	-3.408	0.001	0.432	0.432	-0.415	2.768	0.000

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
25	Nitrogen Dissolved Nitrate	0.483	0.630	0.106	0.088	-0.106	0.654	0.786
26	Nitrogen Dissolved NO3 & NO2	-1.735	0.083	0.316	0.316	-0.314	4.659	0.000
27	Nitrogen Total Ammonia	0.569	0.569	0.162	0.162	-0.130	2.371	0.000
28	Nitrogen Total Kjeldahl	-2.685	0.007	0.147	0.147	-0.123	2.349	0.000
29	Oxygen Biochemical Demand	-4.378	0.000	0.127	0.127	-0.086	1.845	0.002
30	Oxygen Dissolved	-1.392	0.164	0.097	0.097	-0.072	1.485	0.024
31	Oxygen Total COD	0.791	0.429	0.174	0.156	-0.174	1.798	0.003
32	pH (FIELD)	-1.714	0.087	0.151	0.113	-0.151	2.125	0.000
33	Phosphorous Dissolved Ortho	-1.552	0.121	0.241	0.228	-0.241	3.137	0.000
34	Phosphorous Total	-6.556	0.000	0.187	0.174	-0.187	2.899	0.000
35	Potassium Dissolved	-1.298	0.195	0.332	0.332	-0.266	4.297	0.000
36	Residue Fixed non-filterable	-0.920	0.358	0.368	0.323	-0.368	5.775	0.000
37	Residue non-filterable	-1.452	0.147	0.361	0.330	-0.361	5.747	0.000
38	Residue Volatile non-filterable	-0.650	0.516	0.325	0.325	-0.304	4.879	0.000
39	Sodium Dissolved	1.132	0.258	0.081	0.081	-0.052	1.215	0.104
40	Specific Conductance	4.524	0.000	0.097	0.039	-0.097	1.545	0.017
41	Sulphate	-1.739	0.082	0.072	0.069	-0.072	0.837	0.486
42	Sulphate Dissolved	1.725	0.085	0.444	0.444	-0.386	3.077	0.000
43	Water Temperature	0.384	0.701	0.190	0.190	-0.133	2.961	0.000
44	Total Dissolved Solids	-1.504	0.133	0.076	0.049	-0.076	0.915	0.372
45	Turbidity	0.062	0.950	0.227	0.227	-0.151	1.570	0.014
46	pH	2.367	0.018	0.182	0.126	-0.182	2.911	0.000

Sampling site: SK05HF0205 (SASK_20)

Water Quality Variables	Algae at site	Algae in sample	Alkalinity phenolphthalein CaCO3	Alkalinity Total CaCO3	Aluminum Total	Arsenic Total	Barium Total
no.	86	115	74	235	78	81	75
Average	0.2093	0.113	4.4316	155.2797	0.3291	1.2346	0.0832
Median	0	0	4	155	0.12	1.1	0.081
Standard deviation	0.7375	0.6036	4.4023	11.0311	0.6407	0.6429	0.0469
variance	0.5439	0.3643	19.3801	121.6856	0.4104	0.4133	0.0022
Minimum	0	0	0	77	0.006	0.5	0.009
Maximum	6	6	35	245	3.6	4	0.46
Skewness	6.0234	8.3642	4.7647	0.8407	3.6535	3.0187	6.9199
Kurtosis	45.8171	80.3708	32.8788	30.9116	17.0266	13.3195	57.0163
Water Quality Variables	Bicarbonate	Boron Total	Calcium Dissolved	Calcium Hardness	Calcium Total	Carbon Dissolved Organic	Carbon Total
no.	142	40	218	169	52	170	42
Average	184.7473	0.0347	45.1789	112.232	44.5769	3.9541	36.1667
Median	185	0.0255	46	112	45.5	4	36
Standard deviation	13.5137	0.0259	4.9986	14.1933	5.4317	1.1985	3.3197
variance	182.6201	0.0007	24.9863	201.4506	29.5038	1.4363	11.0203
Minimum	90.206	0.01	13	32	13	2	27
Maximum	222	0.15	70	176	54	12.2	43
Skewness	-2.0799	2.6607	-0.722	-0.5734	-3.7529	2.7275	-0.3017
Kurtosis	19.0921	11.2481	13.1709	10.6905	23.239	17.0058	2.9237

Water Quality Variables	Carbon Total Inorganic	Carbon Total Organic	Carbonate	Chloride Dissolved	Chlorophyll A	Chromium Total	Coliforms Fecal
no.	42	39	90	228	66	52	120
Average	31	5.6667	4.576	6.6816	6.492	0.0051	190.2
Median	32	4	3.48	6	4.075	0.004	30
Standard deviation	4.9633	4.6302	5.0455	2.9691	8.9414	0.0051	430.9875
variance	24.6341	21.4386	25.4572	8.8155	79.9478	0	185750.2
Minimum	15	0	0	2	0	0.0001	0
Maximum	39	23	42	17	53	0.027	2400
Skewness	-1.1751	1.7047	4.8302	0.7427	3.4906	2.5923	3.3449
Kurtosis	4.5594	6.3889	35.1412	3.8133	15.823	10.3381	14.5285
Water Quality Variables	Coliforms Total	Conductance	Copper Total	Cyanide Total	Fecal Streptococci	Hardness Total CaCO3	Iron Total
no.	139	208	66	36	165	228	122
Average	465.7842	413.4622	0.0122	2.7167	293.6788	186.0789	0.2971
Median	50	413.5	0.0045	1.4	50	184	0.1
Standard deviation	1256.438	72.3431	0.0394	2.9436	684.8881	13.4057	0.5266
variance	1578636	5233.517	0.0016	8.6649	469071.8	179.7118	0.2773
Minimum	0	4.54	0.0007	0.1	2	144	0.011
Maximum	11000	660	0.32	11	5600	304	3.5
Skewness	5.6954	-1.3917	7.3985	1.4742	4.4229	2.9312	3.932
Kurtosis	42.4017	11.5568	58.2676	4.0008	27.7655	28.4385	20.2111

Water Quality Variables	Magnesium Dissolved	Magnesium Hardness	Magnesium Total	Manganese Total	Nickel Total	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia
no.	217	92	61	103	67	200	180
Average	17.8249	75.3696	17.0984	0.0232	0.0061	0.1729	0.0716
Median	17	72	17	0.01	0.003	0.14	0.05
Standard deviation	3.2584	18.2243	4.2767	0.0491	0.0105	0.4002	0.1259
variance	10.6173	332.1257	18.2902	0.0024	0.0001	0.1602	0.0158
Minimum	8	32	13	0.003	0.001	0.03	0.01
Maximum	38	156	47	0.39	0.072	5.7	1.25
Skewness	1.899	1.2507	5.8432	6.2779	4.4603	13.2641	6.4227
Kurtosis	10.9251	6.7408	40.8493	43.9325	25.8225	183.675	51.4663
Water Quality Variables	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved (field)	Oxygen Dissolved	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved
no.	225	200	81	138	131	195	220
Average	0.5047	1.054	11.773	11.0841	0.0237	0.0574	2.9505
Median	0.4	0.9	11	10.95	0.02	0.04	3
Standard deviation	0.3107	0.8939	4.4593	2.0682	0.0181	0.073	1.4571
variance	0.0965	0.799	19.8854	4.2773	0.0003	0.0053	2.1232
Minimum	0.06	0.1	1.62	2	0.01	0.01	1
Maximum	2.1	7.8	32.17	16.8	0.13	0.8	18
Skewness	2.141	4.461	2.8439	-0.822	2.9703	6.56	5.9646
Kurtosis	9.0879	28.2753	12.3851	5.7925	15.0808	59.8303	56.1021

Water Quality Variables	Potassium Total	Residue Fixed non-filterable	Residue non-filterable	Residue Volatile non-filterable	Selenium Total	Silicon Total	Sodium Dissolved
no.	61	217	231	195	31	47	226
Average	2.4674	11.1475	12.9567	2.2769	0.0266	0.59	21.2257
Median	2.3	4	5	2	0.0006	0.55	21
Standard deviation	0.9925	24.2102	25.8835	1.9936	0.103	0.3561	3.349
variance	0.9851	586.1356	669.9546	3.9745	0.0106	0.1268	11.2155
Minimum	0.2	0	1	0	0.0003	0.08	14
Maximum	6	216	247	11	0.5	1.2	42
Skewness	0.3972	4.8295	5.1425	2.4206	3.9112	0.3617	1.4034
Kurtosis	4.9401	32.2175	37.1642	8.9908	17.1018	1.8016	9.1129
Water Quality Variables	Sodium Total	Specific Conductance	Sulphate	Sulphate Dissolved	Water Temperature	Titanium Total	Total Dissolved Solids
no.	61	236	178	51	221	42	201
Average	20.5607	419.5932	63.2584	69.5961	8.0439	0.0066	344.0338
Median	20	420	62	69.7	8	0.002	344
Standard deviation	4.2073	45.0026	9.9978	9.0913	6.3342	0.0099	34.5606
variance	17.7011	2025.238	99.9554	82.6516	40.1219	0.0001	1194.436
Minimum	8.2	43	44	52	-0.37	0.0006	17.8
Maximum	37	570	113	109.3	21	0.042	561
Skewness	0.9739	-2.3224	1.106	1.678	0.1262	2.3939	-2.6865
Kurtosis	6.8523	23.7091	6.0767	8.9871	1.5729	7.8485	48.8588

Water Quality Variables	Turbidity	Zinc Total	pH
no.	38	52	236
Average	7.2271	0.054	8.2427
Median	1.56	0.017	8.3
Standard deviation	28.9305	0.1063	0.1966
variance	836.9755	0.0113	0.0387
Minimum	0.72	0.001	7.3
Maximum	180	0.62	8.6
Skewness	5.8278	3.7977	-1.697
Kurtosis	35.3082	18.6265	8.072

WQV Code	Water Quality Variables	Mann-Kendall Trend Test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Algae at site	2.339	0.019	0.472	0.472	-0.388	4.379	0.000
2	Algae in sample	0.550	0.583	0.505	0.505	-0.426	5.412	0.000
3	Alkalinity phenolphthalein CaCO3	-0.133	0.894	0.226	0.226	-0.191	1.941	0.001
4	Alkalinity Total CaCO3	4.605	0.000	0.140	0.135	-0.140	2.142	0.000
5	Aluminum Total	-3.863	0.000	0.326	0.326	-0.307	2.881	0.000
6	Arsenic Total	-2.483	0.013	0.226	0.226	-0.175	2.031	0.001
7	Barium Total	1.694	0.090	0.334	0.334	-0.244	2.896	0.000
8	Bicarbonate	2.063	0.039	0.139	0.109	-0.139	1.657	0.008
9	Boron Total	-2.372	0.018	0.297	0.297	-0.198	1.881	0.002
10	Calcium Dissolved	3.739	0.000	0.139	0.139	-0.119	2.059	0.000
11	Calcium Hardness	3.930	0.000	0.120	0.120	-0.112	1.566	0.015
12	Calcium Total	1.354	0.176	0.221	0.169	-0.221	1.597	0.012
13	Carbon Dissolved Organic	4.827	0.000	0.220	0.220	-0.184	2.869	0.000
14	Carbon Total	-1.547	0.122	0.091	0.076	-0.091	0.587	0.881
15	Carbon Total Inorganic	-2.127	0.033	0.214	0.085	-0.214	1.389	0.042
16	Carbon Total Organic	0.794	0.428	0.198	0.198	-0.131	1.238	0.093
17	Carbonate	1.604	0.109	0.229	0.190	-0.229	2.177	0.000
18	Chloride Dissolved	2.871	0.004	0.126	0.126	-0.076	1.901	0.001
19	Chlorophyll A	-1.003	0.316	0.297	0.297	-0.235	2.410	0.000
20	Chromium Total	-1.577	0.115	0.241	0.241	-0.191	1.735	0.005
21	Coliforms Fecal	-1.975	0.048	0.329	0.323	-0.329	3.609	0.000
22	Coliforms Total	-3.137	0.002	0.355	0.315	-0.355	4.190	0.000
23	Conductance	-0.623	0.533	0.125	0.097	-0.125	1.808	0.003

WQV Code	Water Quality Variables	Mann-Kendall Trend Test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
24	Copper Total	-5.211	0.000	0.385	0.346	-0.385	3.125	0.000
25	Cyanide Total	0.557	0.577	0.291	0.291	-0.187	1.744	0.005
26	Fecal Streptococci	0.698	0.485	0.336	0.336	-0.335	4.315	0.000
27	Hardness Total CaCO3	0.837	0.403	0.119	0.119	-0.106	1.794	0.003
28	Iron Total	-7.455	0.000	0.301	0.301	-0.293	3.325	0.000
29	Magnesium Dissolved	-1.986	0.047	0.202	0.202	-0.138	2.977	0.000
30	Magnesium Hardness	-1.501	0.133	0.139	0.139	-0.102	1.332	0.058
31	Magnesium Total	1.566	0.117	0.351	0.351	-0.263	2.741	0.000
32	Manganese Total	-4.893	0.000	0.340	0.338	-0.340	3.455	0.000
33	Nickel Total	-4.120	0.000	0.313	0.287	-0.313	2.565	0.000
34	Nitrogen Dissolved NO3 & NO2	-1.774	0.076	0.361	0.344	-0.361	5.099	0.000
35	Nitrogen Total Ammonia	0.820	0.412	0.314	0.314	-0.312	4.215	0.000
36	Nitrogen Total Kjeldahl	-1.455	0.146	0.197	0.197	-0.146	2.960	0.000
37	Oxygen Biochemical Demand	-0.905	0.365	0.255	0.255	-0.188	3.608	0.000
38	Oxygen Dissolved (field)	0.182	0.856	0.289	0.289	-0.219	2.600	0.000
39	Oxygen Dissolved	-0.007	0.994	0.114	0.040	-0.114	1.339	0.055
40	Phosphorous Dissolved Ortho	0.926	0.355	0.260	0.260	-0.225	2.973	0.000
41	Phosphorous Total	-1.356	0.175	0.268	0.268	-0.268	3.744	0.000
42	Potassium Dissolved	-0.603	0.546	0.336	0.336	-0.248	4.990	0.000
43	Potassium Total	2.931	0.003	0.136	0.092	-0.136	1.064	0.208
44	Residue Fixed non-filterable	-3.222	0.001	0.328	0.319	-0.328	4.837	0.000
45	Residue non-filterable	-4.075	0.000	0.322	0.307	-0.322	4.895	0.000
46	Residue Volatile non-filterable	-2.076	0.038	0.314	0.314	-0.256	4.388	0.000
47	Selenium Total	-1.093	0.274	0.522	0.522	-0.399	2.908	0.000
48	Silicon Total	2.634	0.008	0.173	0.173	-0.094	1.185	0.121

WQV Code	Water Quality Variables	Mann-Kendall Trend Test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
49	Sodium Dissolved	1.694	0.090	0.134	0.134	-0.093	2.014	0.001
50	Sodium Total	2.214	0.027	0.131	0.131	-0.106	1.020	0.250
51	Specific Conductance	4.677	0.000	0.133	0.093	-0.133	2.050	0.000
52	Sulphate	-2.511	0.012	0.083	0.083	-0.065	1.105	0.174
53	Sulphate Dissolved	0.924	0.356	0.174	0.174	-0.126	1.246	0.090
54	Water Temperature	0.686	0.493	0.139	0.139	-0.094	2.061	0.000
55	Titanium Total	-1.551	0.121	0.316	0.316	-0.273	2.050	0.000
56	Total Dissolved Solids	-0.637	0.524	0.176	0.164	-0.176	2.494	0.000
57	Turbidity	1.790	0.073	0.443	0.443	-0.411	2.732	0.000
58	Zinc Total	-2.358	0.018	0.310	0.310	-0.309	2.239	0.000
59	pH	3.703	0.000	0.199	0.127	-0.199	3.063	0.000

Sampling site: SK05KD0154 (SASK_21)

Water Quality Variables	Algae at site	Algae in sample	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Aluminum Total	Arsenic Total	Barium Total
no.	50	74	39	117	47	32	36
Average	0.2	0.1081	4.9705	152.9197	0.8104	1.1781	0.0928
Median	0	0	5	152	0.31	0.8	0.0835
Standard deviation	0.4041	0.3126	3.2641	19.8493	1.2235	0.8717	0.0345
variance	0.1633	0.0977	10.6543	393.9966	1.497	0.7598	0.0012
Minimum	0	0	0	102	0.011	0.5	0.067
Maximum	1	1	13	281	5.3	4	0.26
Skewness	1.5	2.5241	0.0348	2.155	2.4259	2.0826	3.5292
Kurtosis	3.25	7.3712	2.5251	16.7822	8.3461	6.6974	16.7398
Water Quality Variables	Bicarbonate	Calcium Dissolved	Carbon Dissolved Organic	Carbon Total	Carbon Total Inorganic	Carbon Total Organic	Carbonate
no.	58	40	42	57	61	61	56
Average	177.7449	47.425	5.1862	40.807	31.9344	9.5246	4.5014
Median	180.2184	48	4.75	39	32	8	4
Standard deviation	24.2676	4.9711	1.9666	13.4183	6.9279	9.5562	3.9383
variance	588.9173	24.7122	3.8673	180.0514	47.9956	91.3202	15.5105
Minimum	92.644	35	3	17	11	1	0
Maximum	234	57	13.9	130	60	70	15.6
Skewness	-0.6109	-0.65	2.2881	5.182	0.6789	4.3234	0.6457
Kurtosis	4.7288	3.1044	10.4438	35.7397	6.8091	27.4826	2.4804

Water Quality Variables	Chloride Dissolved	Chlorophyll A	Chromium Total	Coliforms Fecal	Coliforms Total	Conductance	Copper Total
no.	113	76	37	68	101	86	45
Average	9.0124	17.0811	0.0062	280.5	1854.881	452.727	0.008
Median	8	11.64	0.005	100	800	420	0.006
Standard deviation	9.1288	16.0871	0.0043	510.9683	2799.957	262.8521	0.0069
variance	83.3341	258.7942	0	261088.6	7839760	69091.21	0
Minimum	2	0.2	0.0008	0	30	5.32	0.0007
Maximum	86	78	0.016	2500	15000	2530	0.025
Skewness	6.5888	1.5842	0.927	3.4101	2.5844	5.8186	1.0357
Kurtosis	51.9445	5.2263	2.8112	14.5028	9.8217	47.0564	3.2107
Water Quality Variables	Fecal Streptococci	Hardness Total CaCO3	Iron Total	Magnesium Dissolved	Magnesium Total	Manganese Total	Nickel Total
no.	65	41	39	40	30	39	34
Average	77.9385	193.6098	0.6272	20.375	17.0667	0.0291	0.0042
Median	30	194	0.3	18	16.5	0.024	0.003
Standard deviation	161.3272	16.8462	1.1416	14.3432	2.8154	0.0298	0.004
variance	26026.46	283.7939	1.3032	205.7276	7.9264	0.0009	0
Minimum	1	156	0.069	15	14	0.004	0.001
Maximum	1000	232	6.6	108	26	0.18	0.021
Skewness	4.1053	-0.058	4.1186	5.9123	1.2416	3.5458	2.5785
Kurtosis	21.0521	3.0962	20.9839	36.6346	4.62	18.1124	10.3552

Water Quality Variables	Nitrogen Dissolved NO3 & NO2	NITROGEN Total Ammonia	Nitrogen Total Kjeldahl	Oil and Grease	Oxygen Biochemical Demand	Oxygen Dissolved	Oxygen Dissolved (field)
no.	67	78	114	51	99	81	36
Average	0.3381	0.1379	0.7196	7.2549	2.1727	10.7988	9.8117
Median	0.3	0.055	0.625	3	1.8	10.7	9.8
Standard deviation	0.2761	0.1776	0.4486	12.411	1.464	2.7641	1.428
variance	0.0762	0.0315	0.2012	154.0337	2.1432	7.6401	2.0393
Minimum	0.01	0.01	0.03	1	0.4	1.5	6.16
Maximum	1.7	0.79	2	70	8.5	19	13.5
Skewness	2.4854	2.0623	1.061	3.4323	2.0159	-0.072	-0.0024
Kurtosis	11.7862	6.505	3.6448	15.6739	8.0397	4.823	3.3378
Water Quality Variables	pH	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved	Potassium Total	Residue Fixed non-filterable	Residue non-filterable
no.	118	85	113	41	30	110	115
Average	8.1265	0.0377	0.1219	3.1707	2.3667	62.9545	73.9043
Median	8.2	0.03	0.08	3	2.25	18	21
Standard deviation	0.3567	0.0355	0.1426	1.4646	0.8087	169.713	189.2099
variance	0.1272	0.0013	0.0203	2.1451	0.654	28802.5	35800.37
Minimum	7.2	0.003	0.01	1	0.9	1	1
Maximum	9.2	0.23	1	9	4.5	1402	1562
Skewness	-0.2932	2.9675	3.6115	1.7792	0.7228	6.0331	5.7603
Kurtosis	3.1573	14.144	19.0992	7.3794	3.6043	43.2584	40.6844

Water Quality Variables	Residue Volatile non-filterable	Sodium Dissolved	Sodium Total	Specific Conductance	Sulphate	Sulphate Dissolved	Water Temperature	Zinc Total
no.	91	52	30	118	51	56	118	36
Average	17.8352	19.75	19.1667	413.5	60.2745	65.1107	9.6853	0.0472
Median	5	20	19	408.5	60	64	9.5	0.013
Standard deviation	53.7906	3.6347	4.035	59.4253	11.674	11.977	8.8695	0.1343
variance	2893.428	13.2108	16.2816	3531.363	136.2831	143.4486	78.6672	0.018
Minimum	1	11	13	240	34	30	0	0.0005
Maximum	398	28	28	600	82	105.6	27.9	0.79
Skewness	5.6373	-0.101	0.5268	0.3002	-0.0458	0.4782	0.2573	4.9693
Kurtosis	36.1049	2.8344	2.4045	4.1612	2.4882	4.9923	1.5536	27.6071

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Algae at site	0.218	0.827	0.490	0.490	-0.310	3.463	0.000
2	Algae in sample	0.199	0.842	0.527	0.527	-0.365	4.535	0.000
3	Alkalinity Phenolphthalein CaCO3	-1.836	0.066	0.116	0.116	-0.075	0.722	0.675
4	Alkalinity Total CaCO3	2.433	0.015	0.127	0.127	-0.106	1.375	0.046
5	Aluminum Total	-3.898	0.000	0.257	0.251	-0.257	1.760	0.004
6	Arsenic Total	-3.325	0.001	0.331	0.331	-0.218	1.872	0.002
7	Barium Total	0.846	0.398	0.282	0.282	-0.228	1.691	0.007
8	Bicarbonate	1.240	0.215	0.112	0.064	-0.112	0.854	0.459
9	Calcium Dissolved	1.748	0.080	0.121	0.086	-0.121	0.766	0.601
10	Carbon Dissolved Organic	-1.065	0.287	0.154	0.154	-0.133	1.001	0.269
11	Carbon Total	-2.383	0.017	0.244	0.244	-0.210	1.843	0.002
12	Carbon Total Inorganic	-2.209	0.027	0.085	0.085	-0.081	0.662	0.773
13	Carbon Total Organic	0.300	0.765	0.201	0.201	-0.186	1.574	0.014
14	Carbonate	-1.186	0.236	0.228	0.228	-0.127	1.703	0.006
15	Chloride Dissolved	0.230	0.818	0.292	0.292	-0.274	3.105	0.000
16	Chlorophyll A	-0.319	0.750	0.189	0.189	-0.147	1.651	0.009
17	Chromium Total	-0.550	0.582	0.188	0.188	-0.132	1.141	0.148
18	Coliforms Fecal	-1.802	0.072	0.292	0.267	-0.292	2.404	0.000
19	Coliforms Total	-1.996	0.046	0.257	0.237	-0.257	2.586	0.000
20	Conductance	1.322	0.186	0.260	0.260	-0.260	2.414	0.000
21	Copper Total	-2.139	0.033	0.185	0.185	-0.143	1.243	0.091
22	Fecal Streptococci	0.240	0.811	0.335	0.335	-0.317	2.701	0.000
23	Hardness Total CaCO3	1.280	0.201	0.099	0.098	-0.099	0.637	0.812
24	Iron Total	-2.215	0.027	0.312	0.309	-0.312	1.951	0.001
25	Magnesium Dissolved	0.751	0.453	0.383	0.383	-0.355	2.420	0.000

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
26	Magnesium Total	4.014	0.000	0.176	0.176	-0.138	0.965	0.310
27	Manganese Total	0.569	0.569	0.204	0.204	-0.200	1.276	0.077
28	Nickel Total	-4.743	0.000	0.280	0.280	-0.217	1.630	0.010
29	Nitrogen Dissolved NO3 & NO2	-0.009	0.993	0.156	0.156	-0.117	1.277	0.077
30	NITROGEN Total Ammonia	-0.564	0.573	0.236	0.233	-0.236	2.081	0.000
31	Nitrogen Total Kjeldahl	-3.021	0.003	0.132	0.132	-0.097	1.404	0.039
32	Oil and Grease	-2.163	0.031	0.337	0.337	-0.307	2.405	0.000
33	Oxygen Biochemical Demand	-1.344	0.179	0.179	0.179	-0.121	1.785	0.003
34	Oxygen Dissolved	-0.820	0.412	0.109	0.087	-0.109	0.978	0.294
35	Oxygen Dissolved (field)	-0.673	0.501	0.077	0.077	-0.075	0.465	0.982
36	pH	1.802	0.072	0.124	0.071	-0.124	1.347	0.053
37	Phosphorous Dissolved Ortho	1.050	0.294	0.216	0.216	-0.206	1.989	0.001
38	Phosphorous Total	-1.665	0.096	0.269	0.269	-0.220	2.860	0.000
39	Potassium Dissolved	-2.037	0.042	0.278	0.278	-0.188	1.781	0.004
40	Potassium Total	2.025	0.043	0.142	0.142	-0.075	0.775	0.585
41	Residue Fixed non-filterable	-4.146	0.000	0.358	0.312	-0.358	3.750	0.000
42	Residue non-filterable	-4.461	0.000	0.350	0.312	-0.350	3.753	0.000
43	Residue Volatile non-filterable	-1.278	0.201	0.377	0.367	-0.377	3.598	0.000
44	Sodium Dissolved	0.963	0.336	0.107	0.107	-0.085	0.773	0.589
45	Sodium Total	2.906	0.004	0.118	0.118	-0.093	0.647	0.796
46	Specific Conductance	3.822	0.000	0.097	0.069	-0.097	1.049	0.221
47	Sulphate	1.872	0.061	0.098	0.069	-0.098	0.703	0.706
48	Sulphate Dissolved	1.271	0.204	0.127	0.127	-0.081	0.952	0.325
49	Water Temperature	0.352	0.725	0.188	0.188	-0.137	2.045	0.000
50	Zinc Total	-3.380	0.001	0.379	0.379	-0.364	2.277	0.000

Sampling site: SK05KD0089 (SASK_22)

Water Quality Variables	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Aluminum Total	Arsenic Total	Barium Total	Bicarbonate	Boron Total
no.	38	100	38	39	46	95	30
Average	2.9174	153.0318	0.07	0.9538	0.0797	182.4908	0.0253
Median	2.32	152.5	0.0425	0.9	0.081	182	0.0255
Standard deviation	2.5413	18.221	0.0717	0.3899	0.0144	18.7934	0.0071
variance	6.4583	332.0035	0.0051	0.152	0.0002	353.1913	0.0001
Minimum	0	118	0.005	0.5	0.0085	141.404	0.012
Maximum	8	260	0.31	1.8	0.1	222	0.05
Skewness	0.5314	2.0231	1.8274	0.6098	-2.6376	0.1085	1.0242
Kurtosis	2.0929	13.3362	5.8537	2.2167	14.0869	2.1958	6.2273
Water quality Variables	Calcium Dissolved	Calcium Hardness	Calcium Total	Carbon Dissolved Organic	Carbonate	Chloride Dissolved	Chlorophyll A
no.	99	40	36	99	38	99	55
Average	46.3636	118.185	45.5833	5.5952	3.4968	9.5535	7.5962
Median	46	116.2	44.5	5	3	6.5	6.46
Standard deviation	4.8349	13.732	5.4792	4.1849	3.0355	32.3906	5.7227
variance	23.3766	188.569	30.0214	17.513	9.2143	1049.151	32.7489
Minimum	36	90	35	3	0	2	0
Maximum	58	145	57	41.6	9.6	328	29.3
Skewness	0.4169	0.0725	0.0495	6.915	0.5066	9.7439	1.1809
Kurtosis	2.8993	2.584	2.537	57.6276	2.0523	96.3063	5.3235

Water Quality Variables	Coliforms Total	Conductance	Copper Total	Fluoride Dissolved	Hardness Total CaCO3	Iron Total	Magnesium Dissolved
no.	50	87	46	33	91	45	100
Average	182.88	377.6862	0.0107	0.1409	182.4835	0.0724	16.06
Median	20	377	0.0061	0.14	180	0.052	16
Standard deviation	432.9249	298.0388	0.0123	0.0153	17.6788	0.056	1.8631
variance	187423.9	88827.15	0.0002	0.0002	312.5414	0.0031	3.4711
Minimum	0	0.37	0.001	0.11	144	0.019	10
Maximum	2224	2640	0.067	0.17	224	0.31	21
Skewness	3.4093	4.889	2.571	-0.1548	0.3521	2.1321	-0.0783
Kurtosis	14.6645	39.4747	10.944	2.5862	2.646	8.6255	3.3539
Water Quality Variables	Magnesium Total	Manganese Total	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved
no.	37	47	47	63	97	62	49
Average	16.1622	0.0211	0.2078	0.1033	0.5106	1.121	8.9088
Median	16	0.018	0.19	0.07	0.5	1	8.73
Standard deviation	2.1149	0.0123	0.1588	0.0841	0.2523	0.582	1.6993
variance	4.473	0.0002	0.0252	0.0071	0.0636	0.3387	2.8875
Minimum	12	0.006	0.02	0.01	0.09	0.3	5.4
Maximum	19	0.073	0.62	0.48	1.4	3	13.7
Skewness	-0.323	2.1275	0.901	1.9709	1.3346	0.9001	0.3893
Kurtosis	2.2131	8.6903	3.0416	8.1892	5.2921	3.4916	3.6358

Water Quality Variables	Oxygen Total COD	pH	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved	Potassium Total	Residue Fixed non-filterable
no.	56	100	44	91	99	36	87
Average	15.8107	8.161	0.0443	0.054	2.4444	2.8389	3.092
Median	15	8.2	0.03	0.04	2	2.6	3
Standard deviation	4.8983	0.2726	0.0905	0.0753	0.6734	1.2103	2.3901
variance	23.993	0.0743	0.0082	0.0057	0.4535	1.4647	5.7124
Minimum	11	6.8	0.01	0.02	2	0.9	0
Maximum	32.1	8.5	0.62	0.72	5	7.4	15
Skewness	1.5118	-1.8249	6.0601	7.7645	1.6135	1.6347	2.1522
Kurtosis	5.5162	8.4493	39.0398	68.7275	5.7156	7.1297	9.6203
Water Quality Variables	Residue non-filterable	Residue Volatile non-filterable	Silicon Total	Sodium Dissolved	Sodium Total	Specific Conductance	Strontium Total
no.	97	93	38	100	37	100	30
Average	4.6907	2.0215	0.8495	17.74	18.1351	411.707	0.3373
Median	4	2	0.795	17	18	408	0.335
Standard deviation	3.0289	0.9553	0.5011	2.4644	3.3843	38.5312	0.0279
variance	9.1742	0.9126	0.2511	6.0731	11.4535	1484.652	0.0008
Minimum	1	1	0.2	12	12	327	0.28
Maximum	19	5	1.8	25	27	507	0.4
Skewness	1.6814	1.1606	0.4891	0.5214	0.5665	0.2716	0.1343
Kurtosis	7.4341	4.4833	2.0027	3.1235	2.9211	2.6734	3.0439

Water Quality Variables	Sulphate	Sulphate Dissolved	Water Temperature	Total Dissolved Solids	Turbidity
no.	60	39	84	75	84
Average	53.1833	65.1641	9.7192	325.8133	2.6371
Median	54	65.2	9.65	324	2.225
Standard deviation	6.9123	7.8339	7.3561	30.8373	1.7247
variance	47.7794	61.3703	54.1121	950.9377	2.9747
Minimum	37	51.7	0	259	0.35
Maximum	68	80.9	22.6	397	9.8
Skewness	0.025	0.2573	0.1625	0.3169	1.367
Kurtosis	2.6583	2.2297	1.4858	2.5428	5.7062

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Phenolphthalein CaCO3	-1.064	0.288	0.143	0.143	-0.125	0.882	0.418
2	Alkalinity Total CaCO3	0.277	0.782	0.072	0.072	-0.065	0.719	0.679
3	Aluminum Total	-2.855	0.004	0.213	0.213	-0.182	1.315	0.063
4	Arsenic Total	0.244	0.807	0.145	0.145	-0.122	0.903	0.388
5	Barium Total	0.190	0.850	0.144	0.093	-0.144	0.979	0.294
6	Bicarbonate	-0.142	0.887	0.073	0.073	-0.045	0.713	0.689
7	Boron Total	0.413	0.680	0.186	0.186	-0.074	1.021	0.248
8	Calcium Dissolved	0.063	0.949	0.135	0.135	-0.062	1.338	0.056
9	Calcium Hardness	0.162	0.871	0.080	0.080	-0.075	0.508	0.958
10	Calcium Total	0.260	0.795	0.114	0.114	-0.090	0.682	0.741
11	Carbon Dissolved Organic	3.024	0.003	0.303	0.303	-0.268	3.018	0.000
12	Carbonate	-1.064	0.287	0.144	0.144	-0.125	0.887	0.410
13	Chloride Dissolved	2.981	0.003	0.478	0.478	-0.408	4.758	0.000
14	Chlorophyll A	0.189	0.850	0.116	0.116	-0.092	0.859	0.452
15	Coliforms Total	3.130	0.002	0.336	0.330	-0.336	2.378	0.000
16	Conductance	-0.190	0.849	0.200	0.200	-0.188	1.862	0.002
17	Copper Total	1.548	0.122	0.252	0.252	-0.217	1.708	0.006
18	Fluoride Dissolved	-0.818	0.413	0.148	0.124	-0.148	0.852	0.463
19	Hardness Total CaCO3	1.053	0.292	0.115	0.115	-0.051	1.094	0.182
20	Iron Total	-2.350	0.019	0.201	0.201	-0.170	1.351	0.052
21	Magnesium Dissolved	2.533	0.011	0.135	0.135	-0.115	1.353	0.051
22	Magnesium Total	1.250	0.211	0.159	0.114	-0.159	0.967	0.307
23	Manganese Total	0.257	0.797	0.194	0.194	-0.136	1.329	0.058
24	Nitrogen Dissolved NO3 & NO2	0.738	0.461	0.157	0.157	-0.119	1.073	0.200

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
25	Nitrogen Total Ammonia	0.197	0.844	0.182	0.182	-0.133	1.448	0.030
26	Nitrogen Total Kjeldahl	-3.395	0.001	0.166	0.166	-0.099	1.638	0.009
27	Oxygen Biochemical Demand	-1.190	0.234	0.176	0.176	-0.079	1.383	0.044
28	Oxygen Dissolved	1.854	0.064	0.082	0.082	-0.065	0.577	0.893
29	Oxygen Total COD	0.768	0.443	0.183	0.183	-0.163	1.367	0.048
30	pH	2.361	0.018	0.167	0.120	-0.167	1.669	0.008
31	Phosphorous Dissolved Ortho	-0.490	0.624	0.386	0.386	-0.352	2.559	0.000
32	Phosphorous Total	-3.218	0.001	0.326	0.295	-0.326	3.111	0.000
33	Potassium Dissolved	2.084	0.037	0.382	0.382	-0.255	3.798	0.000
34	Potassium Total	1.556	0.120	0.174	0.174	-0.112	1.046	0.224
35	Residue Fixed non-filterable	0.512	0.609	0.228	0.228	-0.168	2.127	0.000
36	Residue non-filtrable	0.424	0.672	0.171	0.171	-0.112	1.681	0.007
37	Residue Volatile non-filtrable	0.978	0.328	0.294	0.294	-0.190	2.835	0.000
38	Silicon Total	0.557	0.578	0.118	0.118	-0.097	0.729	0.662
39	Sodium Dissolved	2.797	0.005	0.158	0.158	-0.090	1.580	0.014
40	Sodium Total	1.972	0.049	0.138	0.138	-0.084	0.837	0.486
41	Specific Conductance	1.904	0.057	0.075	0.075	-0.030	0.754	0.621
42	Strontium Total	0.198	0.843	0.129	0.129	-0.101	0.704	0.704
43	Sulphate	0.795	0.427	0.064	0.061	-0.064	0.493	0.968
44	Sulphate Dissolved	1.476	0.140	0.081	0.081	-0.050	0.506	0.960
45	Water Temperature	1.655	0.098	0.170	0.170	-0.101	1.562	0.015
46	Total Dissolved Solids	0.716	0.474	0.073	0.073	-0.047	0.633	0.818
47	Turbidity	2.021	0.043	0.130	0.130	-0.098	1.189	0.118

Sampling site: SK05MC0038 (SASK_23)

Water Quality Variables	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Bicarbonate	Calcium Dissolved	Carbon Dissolved Organic	Carbonate	Chloride Dissolved
no.	34	91	67	75	76	35	91
Average	2.5124	294.1319	362.0747	86.1333	18.1639	3.1143	22.5648
Median	0.0655	304	368	86	15.5	0	17
Standard deviation	3.7702	69.6949	74.9473	19.7548	10.3959	4.4945	36.5068
variance	14.2147	4857.382	5617.097	390.2523	108.0755	20.2007	1332.743
Minimum	0	105	148.718	32	10	0	2
Maximum	15	444	526	131	78	18	350
Skewness	1.6059	-0.3564	-0.3035	-0.3026	4.5315	1.5243	8.0706
Kurtosis	4.93	3.2908	3.7633	3.9753	25.1585	4.7657	72.7439
Water Quality Variables	Chlorophyll A	Coliforms Total	Conductance	Fecal Streptococci	Fluoride Dissolved	Hardness Total CaCO3	Magnesium Dissolved
no.	36	82	30	35	32	77	75
Average	13.7086	1387.829	911.2367	152.9714	0.1984	430.8571	52.4267
Median	11.455	430	969.65	40	0.2	428	53
Standard deviation	10.4908	2376.433	312.5015	393.883	0.0299	94.1637	16.5865
variance	110.0578	5647434	97657.17	155143.8	0.0009	8866.808	275.1128
Minimum	1.25	0	125.8	3	0.14	147	3
Maximum	42.36	12033	1680	2300	0.26	633	88
Skewness	0.7182	2.7557	-0.6351	4.853	-0.0387	-0.5038	-0.16
Kurtosis	2.6808	10.9388	4.3354	26.779	2.4867	3.9398	3.3826

Water Quality Variables	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Total COD	pH	PHOSPHOROUS Dissolved Ortho	Phosphorous Total
no.	42	90	69	30	92	86	93
Average	0.3371	1.9531	2.4652	45.38	8.1397	0.0869	0.2037
Median	0.08	1.3	2.2	43.6	8.2	0.07	0.16
Standard deviation	0.7308	2.3951	1.6287	11.734	0.273	0.1046	0.2122
variance	0.5341	5.7364	2.6526	137.6872	0.0745	0.0109	0.045
Minimum	0.01	0.2	0.8	21.3	7.3	0.01	0.03
Maximum	3.75	15	12	68.5	8.9	0.96	1.25
Skewness	3.6357	4.1742	3.4635	0.2919	-0.9351	6.9038	3.5253
Kurtosis	16.0122	20.8274	19.0677	2.4154	4.3397	57.8658	16.3767
Water Quality Variables	Potassium Dissolved	Residue Fixed-non-filterable	Residue non-filterable	Residue Volatile non-filterable	Sodium Dissolved	Specific Conductance	Sulphate
no.	51	91	91	65	75	93	38
Average	12.2549	22.8791	29.3297	6.7231	39.28	901.914	162.8684
Median	12	16	22	5	36	883	163.5
Standard deviation	3.1613	22.228	26.3228	5.3166	15.8656	261.4659	52.6617
variance	9.9937	494.0852	692.8901	28.2659	251.7178	68364.41	2773.253
Minimum	6	2	3	1	12	339	59
Maximum	18	157	189	32	96	2500	268
Skewness	0.1701	2.8417	2.8502	2.3694	1.2447	2.2986	0.054
Kurtosis	2.1252	15.9268	16.2386	10.6007	5.1611	16.5355	2.4438

Water Quality Variables	Sulphate Dissolved	Water Temperature	Total Dissolved Solids	Turbidity
no.	38	39	50	30
Average	218.8368	8.4449	690.52	18.2187
Median	217.35	6.54	719.5	14.2
Standard deviation	77.5435	8.8299	153.4012	11.5927
variance	6013.002	77.9673	23531.93	134.3917
Minimum	88.4	-0.36	261	4.3
Maximum	418.7	25.86	996	45
Skewness	0.4085	0.4588	-0.7481	0.8925
Kurtosis	2.7962	1.6117	3.5519	2.6084

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Phenolphthalein CaCO3	-3.927	0.000	0.266	0.266	-0.253	1.549	0.017
2	Alkalinity Total CaCO3	1.166	0.244	0.071	0.071	-0.070	0.680	0.744
3	Bicarbonate	1.418	0.156	0.070	0.067	-0.070	0.573	0.898
4	Calcium Dissolved	1.950	0.051	0.117	0.081	-0.117	1.015	0.255
5	Carbon Dissolved Organic	3.868	0.000	0.264	0.264	-0.232	2.301	0.000
6	Carbonate	-4.003	0.000	0.270	0.270	-0.244	1.598	0.012
7	Chloride Dissolved	0.117	0.907	0.295	0.278	-0.295	2.810	0.000
8	Chlorophyll A	0.388	0.698	0.146	0.146	-0.118	0.875	0.428
9	Coliforms Total	2.763	0.006	0.283	0.283	-0.280	2.565	0.000
10	Conductance	0.143	0.887	0.156	0.153	-0.156	0.853	0.460
11	Fecal Streptococci	1.589	0.112	0.372	0.372	-0.352	2.201	0.000
12	Fluoride Dissolved	1.341	0.180	0.107	0.080	-0.107	0.608	0.854
13	Hardness Total CaCO3	2.721	0.007	0.106	0.065	-0.106	0.932	0.351
14	Magnesium Dissolved	2.814	0.005	0.076	0.076	-0.067	0.658	0.780
15	Nitrogen Total Ammonia	-3.196	0.001	0.327	0.305	-0.327	2.121	0.000
16	Nitrogen Total Kjeldahl	-2.128	0.033	0.337	0.337	-0.289	3.194	0.000
17	Oxygen Biochemical Demand	0.997	0.319	0.225	0.225	-0.155	1.871	0.002
18	Oxygen Total COD	1.053	0.292	0.163	0.163	-0.084	0.891	0.406
19	pH	2.306	0.021	0.229	0.138	-0.229	2.194	0.000
20	PHOSPHOROUS Dissolved Ortho	1.588	0.112	0.273	0.273	-0.231	2.531	0.000
21	Phosphorous Total	1.017	0.309	0.281	0.281	-0.210	2.714	0.000
22	Potassium Dissolved	1.498	0.134	0.115	0.115	-0.078	0.822	0.509

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
23	Residue Fixed-non-filterable	0.233	0.816	0.174	0.168	-0.174	1.658	0.008
24	Residue non-filterable	0.055	0.956	0.159	0.152	-0.159	1.513	0.021
25	Residue Volatile non-filterable	-0.537	0.591	0.169	0.169	-0.141	1.366	0.048
26	Sodium Dissolved	1.616	0.106	0.119	0.119	-0.068	1.029	0.240
27	Specific Conductance	3.515	0.000	0.128	0.128	-0.118	1.234	0.095
28	Sulphate	0.704	0.481	0.078	0.077	-0.078	0.482	0.974
29	Sulphate Dissolved	1.358	0.175	0.076	0.076	-0.052	0.469	0.980
30	Water Temperature	-0.363	0.716	0.236	0.236	-0.159	1.476	0.026
31	Total Dissolved Solids	0.276	0.783	0.149	0.076	-0.149	1.056	0.215
32	Turbidity	0.036	0.972	0.209	0.209	-0.119	1.147	0.144

Sampling site: SK05AD0041 (SASK_24)

Water Quality Variables	Alkalinity Total CaCO3	Aluminum Total	Arsenic Total	Barium Total	Bicarbonate	Calcium Dissolved	Carbon Dissolved Organic
no.	71	32	37	34	69	78	70
Average	217.5268	0.3012	1.3703	0.0696	256.1583	47.6026	16.5229
Median	196	0.15	1.2	0.066	237	44	15.15
Standard deviation	79.5433	0.4733	0.6073	0.0164	88.4437	15.6896	8.1967
variance	6327.141	0.224	0.3688	0.0003	7822.295	246.1647	67.1861
Minimum	106	0.005	0.6	0.047	129	26	11.2
Maximum	417	2.4	3.3	0.11	503	88	76.3
Skewness	0.79	3.2329	1.0182	0.9152	0.8119	0.7323	6.0532
Kurtosis	2.7468	13.9233	3.9277	3.3016	2.8628	2.5249	42.9013
Water Quality Variables	Chloride Dissolved	Chlorophyll A	Coliforms Total	Conductance	Fecal Streptococci	Fluoride Dissolved	Hardness Total CaCO3
no.	73	62	62	54	31	37	78
Average	3.9233	17.4005	511.8871	390.9704	60.3871	0.1454	201.1702
Median	3.6	13.015	116	353.75	30	0.14	184
Standard deviation	1.993	19.0308	816.7789	150.7384	104.6151	0.0322	66.7303
variance	3.9721	362.1724	667127.8	22722.06	10944.31	0.001	4452.937
Minimum	0.6	0.47	0	12.1	2	0.09	102
Maximum	11	100.61	3448	850	550	0.24	373
Skewness	1.0428	2.3012	2.033	0.6213	3.6959	0.934	0.7357
Kurtosis	4.4219	9.356	6.2903	3.6211	17.1101	3.7771	2.6574

Water Quality Variables	Iron Total	Magnesium Dissolved	Manganese Total	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved
no.	37	78	37	58	76	35	41
Average	0.9086	20.4487	0.3285	0.5338	1.1121	2.2	8.9373
Median	0.72	18	0.081	0.415	1.1	1.3	9.42
Standard deviation	0.7772	9.0391	0.5776	0.5033	0.5119	1.8652	3.7278
variance	0.6041	81.7051	0.3336	0.2533	0.262	3.4788	13.8965
Minimum	0.32	6	0.017	0.02	0.07	0.6	1.19
Maximum	4.45	71	2.1	1.9	3.8	7.2	18.13
Skewness	3.1905	2.4441	2.2255	0.7446	2.2236	1.5028	-0.0868
Kurtosis	13.7691	13.8166	6.6162	2.545	12.0699	4.0675	3.2079
Water Quality Variables	Oxygen Total COD	Phosphorous Total	Potassium Dissolved	Residue Fixed non-filterable	Residue non-filterable	Residue Volatile non-filterable	Silicon Total
no.	62	80	77	70	76	47	34
Average	40.6	0.13	3.0688	16.2857	19.9079	4.3191	3.1085
Median	40.2	0.1	3	5	8	3	3.05
Standard deviation	8.4838	0.0853	1.2632	25.6256	28.0153	3.5698	2.1319
variance	71.9751	0.0073	1.5956	656.6708	784.8581	12.7438	4.545
Minimum	10	0.03	1	1	3	1	0.46
Maximum	55.1	0.54	7	131	148	17	8.7
Skewness	-0.6123	2.4736	0.5347	2.8362	2.8177	1.9438	0.5061
Kurtosis	4.2785	11.3318	3.3366	11.1251	11.2073	6.4718	2.5464

Water Quality Variables	Sodium Dissolved	Specific Conductance	Sulphate Dissolved	Water Temperature	Total Dissolved Solids	Turbidity	pH
no.	78	78	59	56	47	64	78
Average	17.5385	420.6192	11.1983	8.7943	366.5106	12.1303	8.0197
Median	15.5	385.5	10.2	7.515	336	7.25	8.1
Standard deviation	7.8039	140.1461	4.7717	8.4384	137.5504	11.1212	0.3339
variance	60.9011	19640.94	22.7695	71.2064	18920.12	123.6808	0.1115
Minimum	6	213	2.5	-0.25	179	0.35	7.3
Maximum	41	772	23.3	22.7	706	45	8.6
Skewness	0.8923	0.7312	0.2899	0.228	0.6324	1.6639	-0.4454
Kurtosis	3.1816	2.6341	2.5157	1.4134	2.4349	5.1045	2.2228

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	0.369	0.712	0.161	0.161	-0.080	1.361	0.049
2	Aluminum Total	0.454	0.650	0.269	0.269	-0.266	1.524	0.019
3	Arsenic Total	1.024	0.306	0.151	0.151	-0.108	0.918	0.368
4	Barium Total	-1.098	0.272	0.110	0.110	-0.085	0.641	0.805
5	Bicarbonate	0.782	0.434	0.168	0.168	-0.075	1.398	0.040
6	Calcium Dissolved	0.016	0.988	0.169	0.169	-0.084	1.492	0.023
7	Carbon Dissolved Organic	2.269	0.023	0.343	0.343	-0.258	2.868	0.000
8	Chloride Dissolved	-0.051	0.960	0.142	0.142	-0.071	1.215	0.105
9	Chlorophyll A	1.327	0.184	0.187	0.166	-0.187	1.471	0.026
10	Coliforms Total	2.376	0.018	0.285	0.285	-0.265	2.244	0.000
11	Conductance	-1.597	0.110	0.142	0.142	-0.114	1.043	0.226
12	Fecal Streptococci	-0.052	0.959	0.288	0.288	-0.288	1.606	0.012
13	Fluoride Dissolved	0.106	0.916	0.200	0.200	-0.082	1.217	0.104
14	Hardness Total CaCO3	0.176	0.860	0.172	0.172	-0.069	1.518	0.020
15	Iron Total	0.924	0.356	0.295	0.295	-0.224	1.792	0.003
16	Magnesium Dissolved	0.231	0.817	0.192	0.192	-0.098	1.695	0.006
17	Manganese Total	1.256	0.209	0.385	0.385	-0.295	2.343	0.000
18	Nitrogen Total Ammonia	2.214	0.027	0.158	0.158	-0.154	1.207	0.109
19	Nitrogen Total Kjeldahl	-1.470	0.142	0.152	0.152	-0.101	1.327	0.059
20	Oxygen Biochemical Demand	1.638	0.101	0.209	0.209	-0.195	1.236	0.094
21	Oxygen Dissolved	0.101	0.920	0.121	0.121	-0.087	0.772	0.591
22	Oxygen Total COD	1.542	0.123	0.078	0.044	-0.078	0.611	0.849

WQV code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
23	Phosphorous Total	1.284	0.199	0.180	0.180	-0.133	1.612	0.011
24	Potassium Dissolved	-0.361	0.718	0.184	0.184	-0.141	1.615	0.011
25	Residue Fixed non-filterable	1.204	0.229	0.275	0.268	-0.275	2.304	0.000
26	Residue non-filterable	1.711	0.087	0.273	0.268	-0.273	2.381	0.000
27	Residue Volatile non-filterable	1.968	0.049	0.238	0.238	-0.215	1.630	0.010
28	Silicon Total	2.834	0.005	0.126	0.126	-0.107	0.737	0.649
29	Sodium Dissolved	-0.293	0.769	0.149	0.149	-0.085	1.318	0.062
30	Specific Conductance	0.101	0.920	0.157	0.157	-0.070	1.387	0.043
31	Sulphate Dissolved	0.235	0.814	0.110	0.110	-0.071	0.843	0.475
32	Water Temperature	-0.307	0.759	0.203	0.203	-0.142	1.516	0.020
33	Total Dissolved Solids	0.162	0.872	0.145	0.145	-0.086	0.991	0.280
34	Turbidity	1.787	0.074	0.206	0.206	-0.150	1.649	0.009
35	pH	0.545	0.586	0.154	0.075	-0.154	1.361	0.049

Sampling site: SK05GG0023 (SASK_25)

Water Quality Variables	Algae at site	Algae in sample	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Aluminum Total	Barium Total	Bicarbonate
no.	51	74	85	234	53	37	151
Average	0.2549	0.1622	9.604	151.0949	1.7797	0.0937	174.5218
Median	0	0	6	148	0.65	0.077	169.441
Standard deviation	0.4401	0.3711	21.1772	25.6569	2.6518	0.0438	40.9607
variance	0.1937	0.1377	448.4759	658.2782	7.0318	0.0019	1677.775
Minimum	0	0	0	98.2	0.012	0.042	113.367
Maximum	1	1	156	300	11.8	0.25	519.428
Skewness	1.1248	1.8331	5.3751	2.1717	1.989	1.8593	4.5753
Kurtosis	2.2652	4.3602	33.3584	12.3849	6.3924	6.3036	36.8278
Water Quality Variables	Calcium Dissolved	Calcium Hardness	Carbon Dissolved Organic	Carbon Total	Carbon Total Inorganic	Carbon Total Organic	Carbonate
no.	153	72	142	72	72	72	98
Average	47.5098	118.7528	5.0117	41.1806	32.7292	8.5312	6.8841
Median	47	116.8	4	39	31	7	5.5
Standard deviation	7.5534	21.7391	5.7058	8.8927	7.3724	6.1561	10.0702
variance	57.0542	472.5865	32.5565	79.0796	54.3517	37.8978	101.4095
Minimum	21	54	1	26	14	1	0
Maximum	80	168	66	89	54	35	91.2
Skewness	0.5584	0.1563	8.8313	3.0419	0.4157	1.8749	6.2391
Kurtosis	5.3659	3.1799	93.5764	15.2271	3.6777	7.5709	51.6357

Water Quality Variables	Chloride Dissolved	Chlorophyll A	Coliforms Fecal	Coliforms Total MPN/100 ML	Coliforms Total NO/100ML	Conductance	Copper Total
no.	213	91	94	40	101	122	28
Average	7.8089	17.1331	345.117	1184.213	893.8317	382.2436	0.0054
Median	6	11	10	259	100	372.5	0.003
Standard deviation	12.0549	16.2278	2491.743	2449.352	2730.309	229.1419	0.0087
variance	145.3208	263.3429	6208784	5999324	7454586	52506.01	0.0001
Minimum	1	1.1	0	16	0	0.364	0.0006
Maximum	148	95	24000	14136	20000	2290	0.048
Skewness	8.8244	2.1175	9.2607	3.9585	4.7584	4.7344	4.367
Kurtosis	95.294	8.6822	88.2884	20.7826	28.4244	41.4604	21.9117
Water Quality Variables	Fecal Streptococci	Fluoride Dissolved	Hardness Total CaCO3	Iron Total	Magnesium Dissolved	Manganese Total	Nitrogen Dissolved NO3 & NO2
no.	129	38	154	38	153	39	145
Average	100.3023	0.1439	184.0675	1.5591	15.9379	0.0583	0.4187
Median	20	0.14	180	0.525	15	0.038	0.41
Standard deviation	217.1519	0.0144	28.5713	2.3455	3.3237	0.0574	0.3066
variance	47154.95	0.0002	816.321	5.5012	11.0471	0.0033	0.094
Minimum	1	0.11	114	0.071	9	0.006	0.02
Maximum	1200	0.17	360	10.3	39	0.23	1.31
Skewness	3.6	-0.1696	1.8643	2.179	2.7236	1.508	0.6966
Kurtosis	15.8934	2.7081	11.5677	7.2054	17.787	4.3562	3.0501

Water Quality Variables	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved (Field)	Oxygen Dissolved	Oxygen Total COD	pH
no.	144	240	206	57	102	77	106
Average	0.4106	1.0043	3.3345	9.5837	9.7191	18.0442	8.3504
Median	0.115	0.6	1.8	9.3	9.55	15.1	8.4
Standard deviation	1.7802	2.703	11.2371	2.4196	2.5013	12.8884	1.3955
variance	3.1692	7.306	126.2729	5.8544	6.2563	166.1107	1.9475
Minimum	0.01	0.1	0.1	5.3	3.9	4	0
Maximum	20.5	38	154	19.24	15.9	113	18.4
Skewness	10.3268	11.6512	12.0404	1.2391	0.3301	5.3043	1.4933
Kurtosis	114.9918	152.6567	159.1578	6.6707	2.6802	39.5051	38.3264
Water Quality Variables	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved	Residue Fixed non-filterable	Residue non-filterable	Residue Volatile non-filterable	Sodium Dissolved
no.	138	244	118	226	244	206	183
Average	0.065	0.1915	2.1619	50.2146	56.5656	8.3155	14.3743
Median	0.03	0.09	2	20	26	5.75	13
Standard deviation	0.1694	0.682	1.4373	84.0666	91.5177	9.7517	10.0779
variance	0.0287	0.4651	2.066	7067.188	8375.49	95.0951	101.5638
Minimum	0.009	0.01	1	3	1	0	6
Maximum	1.75	9.07	12	498	550	66	131
Skewness	8.1451	10.4777	3.3648	3.1632	3.1714	2.8889	8.6638
Kurtosis	76.3448	126.1963	21.0539	13.432	13.6118	13.0265	99.4156

Water Quality Variables	Specific Conductance	Sulphate	Sulphate Dissolved	Water Temperature	Titanium Total	Total Dissolved Solids	Turbidity	pH
no.	229	114	70	160	34	126	68	247
Average	391.1921	53.3377	60.8614	10.3254	0.0294	316.7143	33.2993	8.1721
Median	392	52	58.55	11.85	0.014	309	11.6	8.2
Standard deviation	71.461	16.7528	13.5158	8.3759	0.0392	60.5216	54.7977	0.3364
variance	5106.671	280.6571	182.676	70.1551	0.0015	3662.866	3002.791	0.1132
Minimum	240	25	37.5	0	0.0011	212	1.5	6.9
Maximum	750	185	100	27.3	0.16	763	251	9.1
Skewness	1.3314	4.3022	1.0151	0.0742	1.9417	3.4818	2.6657	-0.4341
Kurtosis	7.063	34.7647	3.8352	1.5529	6.252	25.0995	9.8191	3.8024

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Algae at site	-0.684	0.494	0.464	0.464	-0.281	3.313	0.000
2	Algae in sample	-1.053	0.293	0.507	0.507	-0.331	4.359	0.000
3	Alkalinity Phenolphthalein CaCO3	-3.249	0.001	0.373	0.373	-0.325	3.435	0.000
4	Alkalinity Total CaCO3	-1.217	0.224	0.128	0.128	-0.077	1.958	0.001
5	Aluminum Total	-1.481	0.139	0.276	0.276	-0.253	2.007	0.001
6	Barium Total	2.592	0.010	0.227	0.227	-0.161	1.381	0.044
7	Bicarbonate	0.541	0.589	0.156	0.156	-0.108	1.916	0.001
8	Calcium Dissolved	0.785	0.432	0.090	0.090	-0.064	1.110	0.170
9	Calcium Hardness	0.058	0.953	0.088	0.088	-0.051	0.749	0.629
10	Carbon Dissolved Organic	-0.330	0.741	0.292	0.258	-0.292	3.477	0.000
11	Carbon Total	-0.172	0.864	0.227	0.227	-0.151	1.928	0.001
12	Carbon Total Inorganic	-0.348	0.728	0.109	0.109	-0.107	0.924	0.361
13	Carbon Total Organic	0.385	0.700	0.145	0.145	-0.117	1.235	0.095
14	Carbonate	-1.041	0.298	0.261	0.261	-0.247	2.584	0.000
15	Chloride Dissolved	-5.174	0.000	0.310	0.270	-0.310	4.528	0.000
16	Chlorophyll A	0.494	0.621	0.185	0.185	-0.162	1.761	0.004
17	Coliforms Fecal	-4.238	0.000	0.468	0.468	-0.445	4.542	0.000
18	Coliforms Total MPN/100 ML	-1.398	0.162	0.317	0.307	-0.317	2.003	0.001
19	Coliforms Total NO/100ML	-2.977	0.003	0.398	0.398	-0.372	4.001	0.000
20	Conductance	-1.479	0.139	0.205	0.205	-0.204	2.268	0.000
21	Copper Total	-1.556	0.120	0.311	0.311	-0.291	1.647	0.009
22	Fecal Streptococci	1.384	0.166	0.324	0.310	-0.324	3.677	0.000
23	Fluoride Dissolved	-0.723	0.470	0.155	0.134	-0.155	0.958	0.318
24	Hardness Total CaCO3	0.197	0.844	0.105	0.105	-0.085	1.302	0.067
25	Iron Total	-0.918	0.359	0.279	0.279	-0.263	1.721	0.005

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
26	Magnesium Dissolved	-0.710	0.478	0.185	0.185	-0.136	2.290	0.000
27	Manganese Total	-0.629	0.529	0.264	0.264	-0.181	1.647	0.009
28	Nitrogen Dissolved NO3 & NO2	-0.205	0.837	0.097	0.073	-0.097	1.165	0.133
29	Nitrogen Total Ammonia	-1.522	0.128	0.411	0.362	-0.411	4.932	0.000
30	Nitrogen Total Kjeldahl	-4.270	0.000	0.369	0.352	-0.369	5.716	0.000
31	Oxygen Biochemical Demand	-2.614	0.009	0.387	0.380	-0.387	5.551	0.000
32	Oxygen Dissolved (Field)	-0.269	0.788	0.116	0.109	-0.116	0.876	0.427
33	Oxygen Dissolved	0.227	0.820	0.099	0.099	-0.067	0.996	0.274
34	Oxygen Total COD	1.947	0.052	0.188	0.181	-0.188	1.654	0.008
35	pH	0.325	0.745	0.245	0.245	-0.233	2.526	0.000
36	Phosphorous Dissolved Ortho	-1.236	0.216	0.370	0.339	-0.370	4.352	0.000
37	Phosphorous Total	0.024	0.981	0.395	0.367	-0.395	6.171	0.000
38	Potassium Dissolved	-3.134	0.002	0.291	0.291	-0.209	3.157	0.000
39	Residue Fixed non-filterable	1.006	0.314	0.296	0.296	-0.287	4.443	0.000
40	Residue non-filterable	-0.078	0.938	0.284	0.284	-0.272	4.434	0.000
41	Residue Volatile non-filterable	1.080	0.280	0.229	0.229	-0.222	3.291	0.000
42	Sodium Dissolved	-2.973	0.003	0.227	0.222	-0.227	3.067	0.000
43	Specific Conductance	1.936	0.053	0.119	0.119	-0.066	1.802	0.003
44	Sulphate	-0.581	0.561	0.153	0.153	-0.109	1.638	0.009
45	Sulphate Dissolved	-0.041	0.967	0.163	0.163	-0.062	1.361	0.049
46	Water Temperature	1.010	0.313	0.165	0.165	-0.109	2.086	0.000
47	Titanium Total	-1.098	0.272	0.235	0.228	-0.235	1.371	0.047
48	Total Dissolved Solids	-1.713	0.087	0.142	0.142	-0.116	1.589	0.013
49	Turbidity	1.631	0.103	0.312	0.312	-0.281	2.570	0.000
50	pH - 10301 - PH UNITS	1.908	0.057	0.110	0.084	-0.110	1.723	0.005

Sampling site: SK05JL0129 (SASK_26)

Water Quality Variables	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Bicarbonate	Calcium Dissolved	Carbon Dissolved Organic	Carbonate	Chloride Dissolved
no.	45	57	54	42	43	45	69
Average	16.5771	245.9649	265.8121	65	15.4302	19.8933	85.1551
Median	14.9	246	266.961	65	12.1	18	86
Standard deviation	11.8091	14.6226	38.5362	3.3203	12.8512	14.1611	9.8496
variance	139.4537	213.8202	1485.041	11.0244	165.1545	200.5356	97.0152
Minimum	0	222	177	58	9.5	0	60
Maximum	42.3	284	331.568	74	73	51	107.5
Skewness	0.5447	0.2126	-0.4934	0.4087	4.0791	0.536	-0.2466
Kurtosis	2.3816	2.4562	2.3774	2.9619	18.2276	2.3648	3.1333
Water Quality Variables	Chlorophyll A	Coliforms Total	Fecal Streptococci	Fluoride Dissolved	Hardness Total CaCO3	Magnesium Dissolved	Nitrogen Total Ammonia
no.	57	47	44	30	42	42	36
Average	18.9837	3209.468	127.0455	0.2	411.2381	60.4524	0.2967
Median	13	187	35	0.2	408.5	60	0.22
Standard deviation	17.2683	9160.266	216.5485	0.0184	30.398	6.747	0.2853
variance	298.1957	83910474	46893.25	0.0003	924.0395	45.5221	0.0814
Minimum	0.47	10	1	0.16	352	48	0.02
Maximum	66.56	47300	860	0.23	485	76	1
Skewness	0.9841	3.5583	2.2373	-0.542	0.2809	0.262	0.9751
Kurtosis	3.0881	15.3136	7.1329	2.6302	2.5662	2.381	2.8008

Water Quality Variables	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved	Oxygen Total COD	pH	Phosphorous Dissolved Ortho	Phosphorous Total
no.	69	38	39	41	68	57	70
Average	1.5141	2.8342	12.6803	34.0171	8.5897	0.1844	0.3319
Median	1.4	2.7	11.47	33.6	8.6	0.18	0.255
Standard deviation	0.5102	1.4245	6.1729	4.8604	0.2683	0.0979	0.1894
variance	0.2603	2.0293	38.1049	23.624	0.072	0.0096	0.0359
Minimum	0.6	0.6	1.24	21.6	8.1	0.06	0.12
Maximum	3.5	6.7	30.3	46.4	9.1	0.58	1.1
Skewness	1.3196	0.5895	1.5129	-0.0538	0.2601	1.9668	1.6078
Kurtosis	5.8534	2.9522	4.9087	3.426	2.1441	7.7714	6.1533
Water Quality Variables	Potassium Dissolved	Residue Fixed non-filterable	Residue non-filterable	Residue Volatile non-filterable	Sodium Dissolved	Specific Conductance	Sulphate Dissolved
no.	42	64	68	65	42	68	37
Average	17.9286	5.6719	9.2794	4.1231	185.9048	1441.559	444.3324
Median	18	4	8	3	185	1444	438.5
Standard deviation	1.7446	6.3021	7.8128	3.4483	21.3882	166.1487	58.1029
variance	3.0436	39.716	61.0402	11.8909	457.4541	27605.38	3375.947
Minimum	14	1	1	1	148	1000	298.3
Maximum	21	46	51	21	229	1783	538.2
Skewness	-0.308	4.3093	2.7292	2.2915	0.1448	-0.2686	-0.2704
Kurtosis	2.4444	27.4212	13.7106	10.5145	2.1074	3.0262	2.4659

Water Quality Variables	Water Temperature	Turbidity
no.	51	42
Average	10.1596	4.5743
Median	9.81	3.1
Standard deviation	8.1453	4.2092
variance	66.3459	17.7175
Minimum	-0.4	0.5
Maximum	24.95	18.7
Skewness	0.1781	1.9291
Kurtosis	1.6327	6.4952

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Phenolphthalein CaCO3	-0.920	0.358	0.111	0.111	-0.086	0.746	0.634
2	Alkalinity Total CaCO3	-1.317	0.188	0.076	0.076	-0.065	0.570	0.901
3	Bicarbonate	-0.665	0.506	0.101	0.087	-0.101	0.743	0.639
4	Calcium Dissolved	-1.242	0.214	0.107	0.107	-0.079	0.697	0.717
5	Carbon Dissolved Organic	2.357	0.018	0.416	0.416	-0.322	2.726	0.000
6	Carbonate	-0.930	0.352	0.111	0.111	-0.081	0.747	0.632
7	Chloride Dissolved	1.836	0.066	0.071	0.044	-0.071	0.592	0.875
8	Chlorophyll A	0.503	0.615	0.152	0.152	-0.142	1.146	0.145
9	Coliforms Total	2.157	0.031	0.417	0.417	-0.363	2.856	0.000
10	Fecal Streptococci	2.997	0.003	0.295	0.295	-0.280	1.958	0.001
11	Fluoride Dissolved	-0.685	0.493	0.167	0.105	-0.167	0.913	0.375
12	Hardness Total CaCO3	1.396	0.163	0.075	0.075	-0.043	0.483	0.974
13	Magnesium Dissolved	1.389	0.165	0.100	0.100	-0.096	0.647	0.797
14	Nitrogen Total Ammonia	-1.475	0.140	0.190	0.190	-0.166	1.140	0.148
15	Nitrogen Total Kjeldahl	-0.378	0.706	0.134	0.134	-0.093	1.115	0.167
16	Oxygen Biochemical Demand	3.125	0.002	0.112	0.112	-0.063	0.688	0.731
17	Oxygen Dissolved	0.513	0.608	0.231	0.231	-0.171	1.445	0.031
18	Oxygen Total COD	-0.474	0.635	0.088	0.046	-0.088	0.565	0.906
19	pH	0.130	0.897	0.128	0.128	-0.101	1.055	0.216
20	Phosphorous Dissolved Ortho	-1.356	0.175	0.198	0.198	-0.104	1.494	0.023
21	Phosphorous Total	-3.844	0.000	0.167	0.167	-0.132	1.399	0.040
22	Potassium Dissolved	1.183	0.237	0.183	0.127	-0.183	1.186	0.120

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
23	Residue Fixed non-filterable	-2.886	0.004	0.229	0.198	-0.229	1.834	0.002
24	Residue non-filterable	-1.579	0.114	0.199	0.199	-0.145	1.637	0.009
25	Residue Volatile non-filterable	1.507	0.132	0.183	0.182	-0.183	1.472	0.026
26	Sodium Dissolved	1.113	0.266	0.071	0.071	-0.060	0.458	0.985
27	Specific Conductance	2.643	0.008	0.079	0.045	-0.079	0.655	0.784
28	Sulphate Dissolved	1.249	0.212	0.118	0.083	-0.118	0.720	0.677
29	Water Temperature	-0.118	0.906	0.136	0.136	-0.097	0.970	0.303
30	Turbidity	-0.976	0.329	0.193	0.193	-0.172	1.254	0.086

Sampling site: SK05JF0092 (SASK_27)

Water Quality Variables	Algae at site	Algae in sample	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Bicarbonate	Calcium Dissolved	Calcium Hardness
no.	73	104	91	241	161	124	64
Average	0.4521	0.1923	12.0204	195.0423	204.4182	48.0887	117.2344
Median	0	0	8	182	200	46	108
Standard deviation	1.4629	0.4638	11.2479	54.1877	55.6533	13.6882	53.18
variance	2.14	0.2151	126.5154	2936.305	3097.292	187.3661	2828.114
Minimum	0	0	0	94	75.578	13	17
Maximum	12	2	60	484	368.138	95	413
Skewness	6.9031	2.3941	1.6358	1.3228	0.4978	0.2713	2.7024
Kurtosis	54.7279	8.076	6.399	6.484	3.6462	3.5405	16.4592
Water Quality Variables	Carbon Dissolved Organic	Carbon Total	Carbon Total Inorganic	Carbon Total Organic	Carbonate	Chloride Dissolved	Chlorophyll A
no.	143	66	66	66	121	223	97
Average	8.1922	64.3182	46.6818	17.6818	11.044	36.7149	48.2625
Median	7.5	66	44	17	7.2	25	30.65
Standard deviation	3.7946	17.2895	15.173	8.3189	13.1039	32.2788	58.8852
variance	14.3987	298.928	230.2203	69.2049	171.7118	1041.922	3467.462
Minimum	4	28	18	1	0	0.22	1
Maximum	41.8	98	75	51	72	250	415
Skewness	5.1267	-0.0549	0.1058	1.0936	1.8467	2.5958	3.0962
Kurtosis	44.5249	2.1854	1.9137	5.7142	7.1973	13.5581	17.2881

Water Quality Variables	Colfiroms Fecal	Colfiroms Total	Conductance	Escherichia Coli	Fecal Streptococci	Fluoride Dissolved	Hardness Total CaCO3
no.	139	204	173	29	164	27	124
Average	527.0144	1798.074	715.0584	78.7241	157.0793	0.2041	227.9032
Median	40	430	658	31	60	0.21	221
Standard deviation	3002.961	4310.239	290.0833	126.0144	355.7378	0.029	59.6501
variance	9017773	18578159	84148.3	15879.64	126549.4	0.0008	3558.137
Minimum	1	0	300	2	1	0.15	116
Maximum	24000	28000	2200	500	2800	0.27	433
Skewness	7.2533	4.0991	1.9598	2.5163	5.61	-0.0191	0.761
Kurtosis	55.5771	20.7066	8.6923	8.5295	39.3602	2.5716	3.8468
Water Quality Variables	Magnesium Dissolved	Magnesium Total	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved
no.	124	31	140	194	237	218	140
Average	26.1774	24.9355	0.3549	1.0426	2.4669	4.3461	9.5547
Median	25	23	0.15	0.1	1.5	3.2	9.7
Standard deviation	7.3761	8.1524	0.71	2.945	3.36	3.4841	2.7534
variance	54.4073	66.4624	0.5041	8.6731	11.2897	12.1389	7.5812
Minimum	12	5	0.01	0.01	0.4	0	0.1
Maximum	56	41	6.7	33.95	39.7	22	17.2
Skewness	1.2215	0.1309	5.9222	7.6837	6.5036	2.2481	-0.1058
Kurtosis	5.1833	3.0091	48.5331	82.0416	66.0261	9.7267	3.9073

Water Quality Variables	Oxygen Dissolved	Oxygen Total COD	pH	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved	Residue Fixed non-filterable
no.	85	50	241	198	241	119	224
Average	10.0562	31.124	8.2305	0.1676	0.4279	6.3	58.2902
Median	9.3	32.4	8.3	0.06	0.25	6	35.5
Standard deviation	4.0411	15.3523	0.4775	0.2614	0.5919	2.9169	70.6672
variance	16.3307	235.6933	0.228	0.0683	0.3503	8.5083	4993.857
Minimum	1.24	5	6.1	0.01	0.03	2	2
Maximum	31.14	84.2	9.52	1.5	7	19	670
Skewness	2.4942	0.8394	-0.354	2.7855	6.4875	1.5486	3.918
Kurtosis	12.3018	4.4744	4.4887	11.4832	66.0443	6.3749	28.8082
Water Quality Variables	Residue non-filterable	Residue Volatile non-filterable	Sodium Dissolved	Sodium Total	Specific Conductance	Sulphate	Sulphate Dissolved
no.	224	205	124	26	240	114	33
Average	69.6696	11.4195	61.4435	59.5385	747.6	141.4825	172.4697
Median	47	9	51	51	693	112	162.5
Standard deviation	78.9898	9.9862	33.9347	24.4659	278.7961	93.5298	58.2194
variance	6239.388	99.7251	1151.566	598.5785	77727.26	8747.827	3389.493
Minimum	4	1	26	28	81	60	92.4
Maximum	752	82	225	119	1940	723	311.8
Skewness	3.8536	2.6403	2.3593	0.9721	1.2159	3.878	0.7801
Kurtosis	28.4548	15.6499	9.9614	2.874	5.0457	22.1482	2.7218

Water Quality Variables	Air Temperature	Water Temperature	Total Dissolved Solids	Turbidity
no.	142	221	104	48
Average	5.943	9.6572	519.5865	36.421
Median	9.5	9.5	493	22.1
Standard deviation	13.5413	8.3216	183.8906	35.2625
variance	183.3656	69.2494	33815.74	1243.44
Minimum	-25	-0.32	251	2.89
Maximum	30	26	1285	146
Skewness	-0.4896	0.1595	1.7645	1.3014
Kurtosis	2.2119	1.4928	7.4319	4.1572

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Algae at site	-1.241	0.215	0.379	0.347	-0.379	3.235	0.000
2	Algae in sample	-2.724	0.006	0.497	0.497	-0.339	5.072	0.000
3	Alkalinity Phenolphthalein CaCO3	-3.109	0.002	0.156	0.156	-0.143	1.489	0.024
4	Alkalinity Total CaCO3	-2.973	0.003	0.106	0.106	-0.068	1.649	0.009
5	Bicarbonate	-0.670	0.503	0.082	0.082	-0.052	1.035	0.234
6	Calcium Dissolved	1.686	0.092	0.072	0.072	-0.047	0.806	0.534
7	Calcium Hardness	1.058	0.290	0.145	0.145	-0.114	1.156	0.138
8	Carbon Dissolved Organic	2.813	0.005	0.171	0.171	-0.144	2.044	0.000
9	Carbon Total	-2.304	0.021	0.055	0.055	-0.054	0.444	0.989
10	Carbon Total Inorganic	-1.848	0.065	0.100	0.085	-0.100	0.814	0.521
11	Carbon Total Organic	-2.061	0.039	0.104	0.104	-0.057	0.843	0.477
12	Carbonate	-3.738	0.000	0.200	0.180	-0.200	2.196	0.000
13	Chloride Dissolved	-3.935	0.000	0.182	0.179	-0.182	2.723	0.000
14	Chlorophyll A	-0.539	0.590	0.211	0.197	-0.211	2.079	0.000
15	Colfiroms Fecal	-2.607	0.009	0.459	0.459	-0.430	5.409	0.000
16	Colfiroms Total	0.579	0.563	0.338	0.322	-0.338	4.832	0.000
17	Conductance	-2.425	0.015	0.121	0.121	-0.104	1.592	0.013
18	Escherichia Coli	-0.545	0.586	0.307	0.307	-0.271	1.655	0.008
19	Fecal Streptococci	-0.295	0.768	0.330	0.311	-0.330	4.231	0.000
20	Fluoride Dissolved	-1.115	0.265	0.111	0.093	-0.111	0.576	0.895
21	Hardness Total CaCO3	1.823	0.068	0.075	0.075	-0.069	0.831	0.495
22	Magnesium Dissolved	1.798	0.072	0.117	0.117	-0.085	1.304	0.067
23	Magnesium Total	0.890	0.374	0.126	0.126	-0.079	0.703	0.706
24	Nitrogen Dissolved NO3 & NO2	-2.316	0.021	0.314	0.296	-0.314	3.710	0.000

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
25	Nitrogen Total Ammonia	-4.964	0.000	0.363	0.334	-0.363	5.055	0.000
26	Nitrogen Total Kjeldahl	-7.533	0.000	0.273	0.247	-0.273	4.202	0.000
27	Oxygen Biochemical Demand	-2.278	0.023	0.154	0.154	-0.145	2.277	0.000
28	Oxygen Dissolved	1.879	0.060	0.066	0.054	-0.066	0.777	0.582
29	Oxygen Dissolved	1.104	0.270	0.196	0.196	-0.140	1.803	0.003
30	Oxygen Total COD	-0.017	0.987	0.110	0.110	-0.067	0.775	0.586
31	pH	-0.343	0.732	0.076	0.067	-0.076	1.183	0.122
32	Phosphorous Dissolved Ortho	-4.208	0.000	0.279	0.279	-0.273	3.931	0.000
33	Phosphorous Total	-4.491	0.000	0.252	0.225	-0.252	3.912	0.000
34	Potassium Dissolved	3.996	0.000	0.171	0.171	-0.123	1.868	0.002
35	Residue Fixed non-filterable	-0.708	0.479	0.213	0.165	-0.213	3.186	0.000
36	Residue non-filterable	-0.896	0.370	0.203	0.159	-0.203	3.036	0.000
37	Residue Volatile non-filterable	-1.024	0.306	0.148	0.122	-0.148	2.125	0.000
38	Sodium Dissolved	3.780	0.000	0.196	0.196	-0.177	2.180	0.000
39	Sodium Total	1.843	0.065	0.243	0.243	-0.101	1.241	0.092
40	Specific Conductance	-1.091	0.275	0.110	0.110	-0.085	1.708	0.006
41	Sulphate	2.634	0.008	0.232	0.232	-0.220	2.481	0.000
42	Sulphate Dissolved	-1.658	0.097	0.144	0.144	-0.085	0.828	0.499
43	Air Temperature	1.184	0.237	0.118	0.073	-0.118	1.403	0.039
44	Water Temperature	0.489	0.625	0.183	0.183	-0.115	2.724	0.000
45	Total Dissolved Solids	2.710	0.007	0.131	0.131	-0.097	1.336	0.056
46	Turbidity	0.556	0.578	0.173	0.173	-0.171	1.200	0.112

Sampling site: SK05HB0087 (SASK_28)

Water Quality Variables	Algae at site	Algae in sample	Alkalinity Phenolphthalein CaCO3	Alkalinity Total CaCO3	Aluminum Total	Arsenic Total	Barium Total
no.	111	136	81	234	96	72	84
Average	0.0901	0.0662	5.8096	154.0465	4.1492	2.0389	0.1186
Median	0	0	4	151.5	0.66	1.05	0.093
Standard deviation	0.3451	0.2776	15.1864	27.0568	10.5179	2.8199	0.0766
variance	0.1191	0.0771	230.627	732.0685	110.6252	7.9517	0.0059
Minimum	0	0	0	12	0.016	0.3	0.06
Maximum	2	2	138	254	75	18	0.46
Skewness	4.0842	4.4809	8.2849	0.0928	4.5005	3.4081	3.0053
Kurtosis	19.8806	24.2605	72.6645	7.0817	26.428	16.807	12.5191
Water Quality Variables	Bicarbonate	Boron Total	Calcium Dissolved	Calcium Hardness	Calcium Total	Carbon Dissolved Organic	Carbon Total
no.	150	46	172	103	53	179	39
Average	180.6303	0.031	46.0715	119.1942	44.7925	4.8377	37.0769
Median	178.5965	0.022	45	116	45	4	36
Standard deviation	32.4664	0.02	10.6198	28.1604	6.9097	2.809	9.5872
variance	1054.066	0.0004	112.7808	793.0082	47.7446	7.8906	91.915
Minimum	4.876	0.01	5	57	32	1	4
Maximum	258	0.09	86	216	68	16	61
Skewness	-0.6665	1.6054	0.6686	0.9138	0.7231	1.7107	-0.2603
Kurtosis	7.9302	4.6862	5.4518	4.4025	4.179	5.8745	6.0346

Water Quality Variables	Carbon Total Inorganic	Carbon Total Organic	Carbonate	Chloride Dissolved	Chlorophyll A	Chromium Total	Cobalt Total
no.	38	37	93	221	68	76	33
Average	32.2895	5.8378	6.0043	7.8611	12.9135	0.0112	0.0038
Median	31	6	3.6	7	7.38	0.004	0.002
Standard deviation	8.0368	3.4279	14.422	4.8441	16.4003	0.0192	0.0047
variance	64.5896	11.7508	207.9949	23.4654	268.9713	0.0004	0
Minimum	22	0	0	0.1	0.7	0.0007	0.0001
Maximum	60	14	139.2	40	94	0.118	0.021
Skewness	1.5927	0.4586	8.6006	2.3912	3.1398	3.7595	2.1968
Kurtosis	5.6714	3.0945	79.9513	13.5273	13.9486	18.4661	7.6317
Water Quality Variables	Coliforms Fecal	Coliforms Total	Coliforms Total	Conductance	Copper Total	Cyanide Total	Fecal Streptococci
no.	126	25	138	207	89	39	137
Average	167.5794	3046.64	327.9058	398.4285	0.0113	4.8374	93.7226
Median	29	301	100	390	0.008	2	40
Standard deviation	520.1125	9445.426	644.7095	80.655	0.0128	8.8941	143.6676
variance	270517	89216074	415650.3	6505.223	0.0002	79.1043	20640.39
Minimum	0	20	0	200	0.001	0.059	2
Maximum	4300	44300	4700	670	0.078	52	830
Skewness	5.8867	3.761	4.2531	0.4311	2.7885	4.1657	2.9446
Kurtosis	40.8976	16.2359	24.9345	3.2882	12.7566	21.7811	12.3485

Water Quality Variables	Fluoride Dissolved	Hardness Total CaCO3	Iron Total	Lead Total	Magnesium Dissolved	Magnesium Total	Manganese Total
no.	35	175	90	43	170	70	88
Average	0.1485	186.0218	2.723	0.0259	17.0912	17.8143	0.0686
Median	0.15	180	0.825	0.007	17	18	0.033
Standard deviation	0.0255	32.7142	6.0845	0.066	3.3949	3.307	0.0981
variance	0.0006	1070.22	37.0208	0.0044	11.5253	10.936	0.0096
Minimum	0.1	132.3787	0.097	0.0002	7	13	0
Maximum	0.22	324	47	0.306	32	28	0.56
Skewness	0.5598	1.1462	5.0137	3.4986	1.3831	1.0316	2.9518
Kurtosis	3.9563	4.6496	33.638	14.0009	7.5787	4.2491	12.5701
Water Quality Variables	Mercury Total	Nickel Total	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved (field)
no.	36	80	138	179	223	203	92
Average	0.1611	0.009	0.5472	0.1407	0.9297	2.5453	10.0954
Median	0.04	0.006	0.54	0.07	0.7	1.6	8.81
Standard deviation	0.4235	0.0114	0.4073	0.1841	1.0971	2.9402	5.216
variance	0.1793	0.0001	0.1659	0.0339	1.2036	8.6448	27.207
Minimum	0.02	0.001	0.02	0.01	0.1	0.3	1.45
Maximum	2.04	0.068	1.69	1.68	11.5	20	33.95
Skewness	3.7735	3.0104	0.5252	4.0365	5.7767	3.3444	2.4228
Kurtosis	15.8892	13.7408	2.4494	29.4727	47.6589	15.7783	10.522

Water Quality Variables	Oxygen Dissolved	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved	Potassium Total	Residue Fixed non-filterable	Residue non-filterable
no.	123	151	236	169	67	235	236
Average	10.022	0.049	0.1868	3.2482	2.6415	106.2851	120.911
Median	9.8	0.03	0.1025	3	2.6	37	44
Standard deviation	2.4337	0.0503	0.2694	2.3585	1.3676	188.4779	207.951
variance	5.9227	0.0025	0.0726	5.5625	1.8704	35523.92	43243.62
Minimum	2.1	0.003	0.01	1	0.3	1	3
Maximum	16.8	0.37	2.9	21	6	1355	1530
Skewness	-0.0446	3.0482	5.4449	3.9134	0.6408	3.6512	3.6715
Kurtosis	3.7207	16.1981	47.4152	24.5966	2.9189	19.2059	19.6549
Water Quality Variables	Residue Volatile non-filterable	Silicon Total	Sodium Dissolved	Sodium Total	Specific Conductance	Sulphate	Sulphate Dissolved
no.	214	64	176	70	215	136	41
Average	15.6589	1.6852	19.6807	20.5957	415.8	58.9706	67.6829
Median	7	0.965	19	20	408	59.5	66.7
Standard deviation	26.9029	2.173	6.5879	8.0128	80.7991	15.0402	23.0667
variance	723.7657	4.7219	43.3999	64.2042	6528.488	226.2065	532.075
Minimum	1	0.07	6	8.4	250	16	30
Maximum	237	12	57	58	740	102	181.2
Skewness	4.619	3.2505	1.2571	1.8426	0.6175	-0.0389	2.8244
Kurtosis	30.8558	14.4548	8.2059	9.1005	3.943	3.3478	15.4868

Water Quality Variables	Water Temperature	Titanium Total	Total Dissolved Solids	Turbidity	Vanadium Total	Zinc Total	pH
no.	226	76	145	42	34	76	235
Average	10.2835	0.0441	341.5034	28.889	0.021	0.0468	8.1823
Median	10	0.011	334	11	0.01	0.018	8.2
Standard deviation	8.7473	0.1307	56.8697	65.3384	0.0273	0.0656	0.3557
variance	76.5151	0.0171	3234.168	4269.109	0.0007	0.0043	0.1265
Minimum	-7	0.002	189	0.29	0.0003	0.003	6.8
Maximum	29	0.99	584	400	0.11	0.34	11
Skewness	0.1819	5.9663	0.8551	4.746	2.0349	2.4617	1.1244
Kurtosis	1.6369	40.6516	5.0492	26.4762	6.5414	9.0665	20.4195

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Algae at site	-1.280	0.201	0.531	0.531	-0.397	5.593	0.000
2	Algae in sample	-1.342	0.180	0.535	0.535	-0.406	6.244	0.000
3	Alkalinity Phenolphthalein CaCO3	-1.023	0.306	0.369	0.369	-0.351	3.317	0.000
4	Alkalinity Total CaCO3	1.866	0.062	0.070	0.069	-0.070	1.070	0.202
5	Aluminum Total	-3.242	0.001	0.353	0.353	-0.347	3.460	0.000
6	Arsenic Total	-3.971	0.000	0.312	0.312	-0.269	2.646	0.000
7	Barium Total	-1.318	0.187	0.310	0.310	-0.222	2.843	0.000
8	Bicarbonate	1.607	0.108	0.073	0.073	-0.062	0.895	0.399
9	Boron Total	-1.730	0.084	0.280	0.280	-0.155	1.902	0.001
10	Calcium Dissolved	0.177	0.860	0.126	0.126	-0.090	1.648	0.009
11	Calcium Hardness	1.316	0.188	0.135	0.135	-0.076	1.366	0.048
12	Calcium Total	1.614	0.107	0.076	0.076	-0.054	0.553	0.920
13	Carbon Dissolved Organic	2.597	0.009	0.203	0.203	-0.139	2.719	0.000
14	Carbon Total	0.012	0.990	0.148	0.144	-0.148	0.927	0.356
15	Carbon Total Inorganic	-0.340	0.734	0.184	0.184	-0.103	1.133	0.154
16	Carbon Total Organic	0.290	0.772	0.102	0.102	-0.080	0.620	0.837
17	Carbonate	-0.268	0.789	0.339	0.337	-0.339	3.265	0.000
18	Chloride Dissolved	1.146	0.252	0.157	0.157	-0.100	2.341	0.000
19	Chlorophyll A	-0.117	0.907	0.272	0.272	-0.229	2.245	0.000
20	Chromium Total	-1.654	0.098	0.292	0.262	-0.292	2.548	0.000
21	Cobalt Total	-2.046	0.041	0.253	0.253	-0.217	1.452	0.029
22	Coliforms Fecal	-1.119	0.263	0.374	0.325	-0.374	4.194	0.000
23	Coliforms Total	-1.472	0.141	0.449	0.449	-0.374	2.245	0.000
24	Coliforms Total	-3.788	0.000	0.306	0.285	-0.306	3.589	0.000

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
25	Conductance	-0.067	0.946	0.072	0.072	-0.036	1.035	0.234
26	Copper Total	-4.704	0.000	0.210	0.198	-0.210	1.976	0.001
27	Cyanide Total	1.017	0.309	0.325	0.325	-0.296	2.032	0.001
28	Fecal Streptococci	1.275	0.202	0.262	0.256	-0.262	3.062	0.000
29	Fluoride Dissolved	0.725	0.469	0.190	0.190	-0.124	1.125	0.159
30	Hardness Total CaCO3	0.166	0.868	0.119	0.119	-0.068	1.573	0.014
31	Iron Total	-2.921	0.004	0.333	0.327	-0.333	3.159	0.000
32	Lead Total	-1.641	0.101	0.409	0.409	-0.348	2.680	0.000
33	Magnesium Dissolved	0.614	0.539	0.147	0.147	-0.087	1.922	0.001
34	Magnesium Total	-0.394	0.694	0.146	0.146	-0.073	1.219	0.102
35	Manganese Total	-1.226	0.220	0.264	0.264	-0.244	2.481	0.000
36	Mercury Total	-2.849	0.004	0.409	0.409	-0.369	2.453	0.000
37	Nickel Total	-4.620	0.000	0.241	0.232	-0.241	2.157	0.000
38	Nitrogen Dissolved NO3 & NO2	-1.220	0.223	0.099	0.099	-0.098	1.165	0.133
39	Nitrogen Total Ammonia	-1.412	0.158	0.239	0.214	-0.239	3.196	0.000
40	Nitrogen Total Kjeldahl	-2.586	0.010	0.241	0.241	-0.240	3.599	0.000
41	Oxygen Biochemical Demand	2.956	0.003	0.256	0.256	-0.228	3.652	0.000
42	Oxygen Dissolved (field)	-0.560	0.576	0.210	0.210	-0.151	2.011	0.001
43	Oxygen Dissolved	-0.729	0.466	0.081	0.081	-0.058	0.893	0.402
44	Phosphorous Dissolved Ortho	0.452	0.652	0.233	0.233	-0.213	2.863	0.000
45	Phosphorous Total	-2.916	0.004	0.266	0.266	-0.256	4.094	0.000
46	Potassium Dissolved	-0.493	0.622	0.293	0.293	-0.233	3.814	0.000
47	Potassium Total	2.037	0.042	0.158	0.158	-0.070	1.292	0.071

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
48	Residue Fixed non-filterable	-1.819	0.069	0.288	0.279	-0.288	4.418	0.000
49	Residue non-filterable	-2.136	0.033	0.285	0.267	-0.285	4.384	0.000
50	Residue Volatile non-filterable	-1.288	0.198	0.293	0.263	-0.293	4.285	0.000
51	Silicon Total	1.432	0.152	0.245	0.245	-0.231	1.956	0.001
52	Sodium Dissolved	1.385	0.166	0.085	0.085	-0.053	1.133	0.153
53	Sodium Total	1.671	0.095	0.121	0.121	-0.067	1.014	0.255
54	Specific Conductance	2.068	0.039	0.053	0.053	-0.040	0.775	0.585
55	Sulphate	-0.990	0.322	0.057	0.048	-0.057	0.663	0.772
56	Sulphate Dissolved	2.483	0.013	0.153	0.153	-0.097	0.978	0.294
57	Water Temperature	0.287	0.774	0.178	0.178	-0.107	2.672	0.000
58	Titanium Total	-2.214	0.027	0.374	0.344	-0.374	3.258	0.000
59	Total Dissolved Solids	-0.134	0.894	0.083	0.083	-0.047	0.995	0.276
60	Turbidity	1.431	0.152	0.339	0.339	-0.331	2.195	0.000
61	Vanadium Total	-1.819	0.069	0.225	0.224	-0.225	1.310	0.065
62	Zinc Total	-2.671	0.008	0.252	0.239	-0.252	2.197	0.000
63	pH	3.113	0.002	0.171	0.143	-0.171	2.619	0.000

Sampling site: SK05HH0176 (SASK_29)

Water Quality Variables	Alkalinity Total CaCO3	Barium Total	Bicarbonate	Calcium Dissolved	Calcium Hardness	Carbon Dissolved Organic	Chloride Dissolved
no.	63	30	56	60	47	58	64
Average	158.1482	0.0828	187.5299	46.7667	114.183	4.4876	8.2609
Median	158	0.087	189.5	46	113	4	7
Standard deviation	11.6547	0.0252	17.9014	4.6954	10.7245	1.3751	10.6042
variance	135.831	0.0006	320.4605	22.0463	115.0154	1.891	112.4488
Minimum	130	0.006	143.842	38	94	3	1.6
Maximum	195	0.14	238	62	142	11.5	89.2
Skewness	0.4546	-0.9227	-0.418	0.6613	0.1883	2.7306	7.0924
Kurtosis	4.5899	5.3157	4.1842	4.1231	3.0489	13.444	54.7434
Water Quality Variables	Coliforms Total	Conductance	Fecal Streptococci	Hardness Total CaCO3	Iron Total	Magnesium Dissolved	Manganese Total
no.	38	56	43	65	30	59	30
Average	134.4211	448.625	72.5116	190.8462	0.2355	18.322	0.0267
Median	100	430	30	187	0.18	18	0.016
Standard deviation	112.8205	100.0931	118.4456	21.8491	0.1678	3.7113	0.0488
variance	12728.47	10018.64	14029.35	477.3822	0.0282	13.7738	0.0024
Minimum	10	200	10	166	0.064	13	0.007
Maximum	430	781	590	320	0.81	40	0.28
Skewness	1.0415	0.7835	3.0216	3.4394	1.6758	3.5763	4.8761
Kurtosis	3.1564	4.9655	11.9256	20.1173	5.8716	21.0589	25.8325

Water Quality Variables	Nitrogen Dissolved NO3 & NO2	Nitrogen Total Ammonia	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Dissolved	Phosphorous Total	Potassium Dissolved
no.	51	45	65	56	59	55	60
Average	0.16	0.0918	0.6043	1.4071	10.0792	0.0751	2.8917
Median	0.15	0.07	0.5	1	10.1	0.05	3
Standard deviation	0.0798	0.0728	0.3974	1.572	1.7798	0.0641	1.4685
variance	0.0064	0.0053	0.1579	2.4712	3.1679	0.0041	2.1564
Minimum	0.02	0.02	0.1	0.4	6.9	0.01	2
Maximum	0.44	0.4	2.84	12	14	0.34	13
Skewness	0.9195	2.4434	2.8972	5.6371	0.0736	2.4437	5.5369
Kurtosis	4.7966	10.1097	16.5367	38.2507	2.2417	9.676	38.7844
Water Quality Variables	Residue Fixed non-filterable	Residue non-filterable	Residue Volatile non-filtrable	Sodium Dissolved	Specific Conductance	Sulphate	Water Temperature
no.	57	63	55	60	65	51	63
Average	11.1754	13.4286	2.48	24.6167	452.9846	63.3333	10.6524
Median	7	8	2	22	439	60	12
Standard deviation	13.5964	14.4431	1.4999	15.1401	92.3012	11.16	8.4988
variance	184.8615	208.6037	2.2498	229.2234	8519.515	124.5467	72.2303
Minimum	1	1	1	16	380	42	-1
Maximum	75	82	8	136	1133	91	25.3
Skewness	3.0464	2.9862	1.634	6.7876	6.284	0.5682	-0.0022
Kurtosis	13.528	13.3903	5.9351	50.5041	46.821	2.9419	1.5187

Water Quality Variables	Total Dissolved Solids	pH
no.	51	63
Average	347.2157	8.2805
Median	343	8.3
Standard deviation	25.5212	0.2071
variance	651.3325	0.0429
Minimum	298	7.8
Maximum	449	8.88
Skewness	1.2273	0.4399
Kurtosis	6.3746	3.4783

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	3.173	0.002	0.133	0.133	-0.093	1.057	0.214
2	Barium Total	1.260	0.208	0.165	0.153	-0.165	0.902	0.390
3	Bicarbonate	2.061	0.039	0.143	0.100	-0.143	1.073	0.200
4	Calcium Dissolved	2.948	0.003	0.115	0.115	-0.111	0.890	0.407
5	Calcium Hardness	3.714	0.000	0.102	0.074	-0.102	0.697	0.716
6	Carbon Dissolved Organic	4.515	0.000	0.294	0.294	-0.206	2.237	0.000
7	Chloride Dissolved	1.317	0.188	0.334	0.334	-0.279	2.670	0.000
8	Coliforms Total	0.949	0.343	0.225	0.225	-0.135	1.388	0.042
9	Conductance	1.991	0.047	0.173	0.173	-0.154	1.297	0.069
10	Fecal Streptococci	0.254	0.799	0.333	0.333	-0.299	2.182	0.000
11	Hardness Total CaCO3	2.682	0.007	0.161	0.161	-0.155	1.295	0.070
12	Iron Total	0.179	0.858	0.174	0.174	-0.153	0.950	0.327
13	Magnesium Dissolved	1.246	0.213	0.196	0.196	-0.168	1.502	0.022
14	Manganese Total	0.465	0.642	0.349	0.349	-0.343	1.910	0.001
15	Nitrogen Dissolved NO3 & NO2	0.114	0.909	0.099	0.099	-0.068	0.706	0.701
16	Nitrogen Total Ammonia	0.128	0.898	0.171	0.171	-0.162	1.150	0.142
17	Nitrogen Total Kjeldahl	-3.732	0.000	0.181	0.181	-0.127	1.461	0.028
18	Oxygen Biochemical Demand	-2.526	0.012	0.262	0.262	-0.261	1.962	0.001
19	Oxygen Dissolved	-1.004	0.315	0.080	0.063	-0.080	0.615	0.844
20	Phosphorous Total	-1.883	0.060	0.222	0.222	-0.159	1.650	0.009
21	Potassium Dissolved	2.997	0.003	0.354	0.354	-0.272	2.742	0.000

WQV Code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
22	Residue Fixed non-filterable	2.381	0.017	0.254	0.254	-0.227	1.916	0.001
23	Residue non-filterable	2.128	0.033	0.234	0.234	-0.199	1.861	0.002
24	Residue Volatile non-filtrable	0.084	0.933	0.280	0.280	-0.162	2.077	0.000
25	Sodium Dissolved	2.556	0.011	0.319	0.319	-0.291	2.474	0.000
26	Specific Conductance	4.837	0.000	0.249	0.249	-0.215	2.004	0.001
27	Sulphate	-0.435	0.664	0.141	0.141	-0.076	1.009	0.260
28	Water Temperature	-0.201	0.841	0.174	0.174	-0.108	1.378	0.045
29	Total Dissolved Solids	1.060	0.289	0.106	0.106	-0.074	0.760	0.610
30	pH	-0.075	0.941	0.125	0.110	-0.125	0.991	0.280

Sampling site: SK05NB0198 (SASK_30)

Water Quality Variables	Alkalinity Total CaCO3	Bicarbonate	Calcium Dissolved	Carbon Dissolved Organic	Chloride Dissolved	Chlorophyll A	Coliforms Total
no.	41	29	31	30	41	35	39
Average	370.6829	465.6552	61.4839	22.5993	50.3976	10.9703	2514.513
Median	341	420	55	19.4	40.9	5.52	500
St-deviation	139.1956	163.5369	20.053	15.822	30.8604	13.6022	4862.13
variance	19375.42	26744.31	402.1247	250.3362	952.3627	185.0196	23640307
Minimum	140	268	34	10.6	6	1.77	20
Maximum	780	952	120	97.6	151.2	73	19700
Skewness	1.0605	1.1569	1.3764	3.8058	1.1288	3.0491	2.6408
Kurtosis	3.9524	4.0921	4.1856	18.2657	4.0842	13.6197	8.9293
Water Quality Variables	Conductance	Fecal Streptococci	Hardness Total CaCO3	Magnesium Dissolved	Nitrogen Total Kjeldahl	Oxygen Biochemical Demand	Oxygen Total COD
no.	27	33	31	31	41	31	28
Average	1467.741	148.2727	342.4516	44.5161	1.5646	3.3258	50.2143
Median	1466	70	311	44	1.4	2.6	50.1
St-deviation	681.3324	203.0576	104.7552	15.5796	0.5864	2.739	14.2962
variance	464213.9	41232.39	10973.66	242.7247	0.3438	7.502	204.382
Minimum	165	10	192	14	0.8	0	23.1
Maximum	3100	970	678	92	3.1	14.1	77.6
Skewness	0.0426	2.5022	1.2712	0.7556	0.8658	2.2477	0.1149
Kurtosis	3.1911	9.5868	4.7267	4.269	3.2622	8.9945	2.228

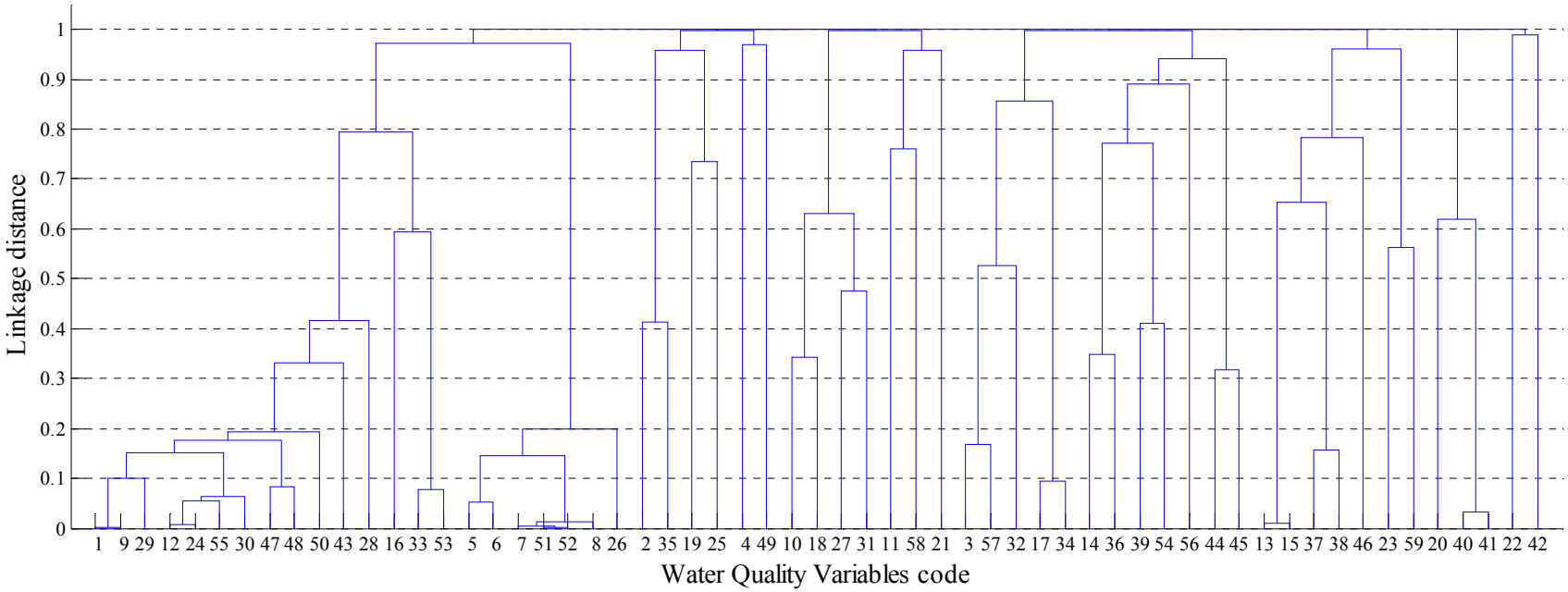
Water Quality Variables	pH	Phosphorous Dissolved Ortho	Phosphorous Total	Potassium Dissolved	Residue Fixed non-filterable	Residue non-filterable	Sodium Dissolved
no.	41	40	41	31	41	41	31
Average	8.1805	0.2136	0.3121	14.0323	17.6098	22.1951	244.7097
Median	8.3	0.12	0.25	14	6	9	241
Standard deviation	0.3242	0.2131	0.2346	2.8459	25.6329	29.9334	104.9788
variance	0.1051	0.0454	0.055	8.0989	657.0439	896.011	11020.55
Minimum	7.5	0.003	0.06	9	1	2	87
Maximum	8.9	1.1	1.2	22	107	125	492
Skewness	-0.2463	2.0864	1.6432	0.602	2.3204	2.3452	0.391
Kurtosis	2.3674	8.5263	6.2708	3.5145	7.6426	7.7472	2.832

Water Quality Variables	Specific Conductance	Sulphate Dissolved	Water Temperature	Turbidity
no.	41	28	33	28
Average	1531.146	414.4536	10.5345	24.1493
Median	1500	448.75	13	9.3
Standard deviation	499.4699	150.2067	8.6825	34.2798
variance	249470.2	22562.05	75.3861	1175.108
Minimum	390	151.9	-0.37	0.98
Maximum	2957	726.5	25.66	150
Skewness	0.2731	-0.1105	0.0045	2.31
Kurtosis	3.4499	2.5061	1.4318	8.0616

WQV code	Water Quality Variables	Mann-Kendall Trend test		One-Sample Kolmogorov-Smirnov Test				
				Most Extreme Differences			Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
		Z	p-value	Absolute	Positive	Negative		
1	Alkalinity Total CaCO3	0.427	0.670	0.152	0.152	-0.073	0.972	0.302
2	Bicarbonate	-0.807	0.420	0.152	0.152	-0.113	0.819	0.513
3	Calcium Dissolved	0.783	0.434	0.239	0.239	-0.127	1.332	0.058
4	Carbon Dissolved	-2.231	0.026	0.327	0.327	-0.224	1.793	0.003
5	Chloride Dissolved	0.415	0.678	0.160	0.160	-0.087	1.022	0.247
6	Chlorophyll A	0.085	0.932	0.253	0.253	-0.249	1.498	0.023
7	Coliforms Total	0.169	0.866	0.334	0.334	-0.304	2.087	0.000
8	Conductance	-1.819	0.069	0.102	0.097	-0.102	0.530	0.942
9	Fecal Streptococci	-0.295	0.768	0.293	0.293	-0.248	1.686	0.007
10	Hardness Total CaCO3	0.221	0.825	0.187	0.187	-0.079	1.040	0.230
11	Magnesium Dissolved	0.862	0.389	0.146	0.146	-0.053	0.815	0.520
12	Nitrogen Total Kjeldahl	-1.913	0.056	0.129	0.129	-0.096	0.828	0.500
13	Oxygen Biochemical Demand	2.164	0.031	0.217	0.217	-0.154	1.206	0.109
14	Oxygen Total COD	-2.840	0.005	0.082	0.082	-0.067	0.434	0.992
15	pH	1.217	0.224	0.183	0.099	-0.183	1.169	0.130
16	Phosphorous Dissolved Ortho	-0.887	0.375	0.217	0.217	-0.170	1.374	0.046
17	Phosphorus Total	-0.956	0.339	0.173	0.173	-0.141	1.109	0.171
18	Potassium Dissolved	2.321	0.020	0.117	0.117	-0.108	0.654	0.786
19	Residue Fixed nonfilterable	-2.379	0.017	0.272	0.272	-0.258	1.743	0.005
20	Residue nonfiterable	-2.435	0.015	0.250	0.237	-0.250	1.600	0.012
21	Sodium Dissolved	-1.263	0.207	0.085	0.085	-0.074	0.475	0.978
22	Specific Conductance	-0.122	0.903	0.069	0.069	-0.051	0.439	0.990
23	Sulphate Dissolved	-1.735	0.083	0.125	0.087	-0.125	0.662	0.773
24	Water Temperature	-0.255	0.798	0.181	0.181	-0.151	1.037	0.232
25	Turbidity	-1.722	0.085	0.267	0.267	-0.250	1.413	0.037

APPENDIX G: WATER QUALITY VARIABLES RATIONALIZATION RESULTS.

Churchill River SA06EA0003 (SASK_1)

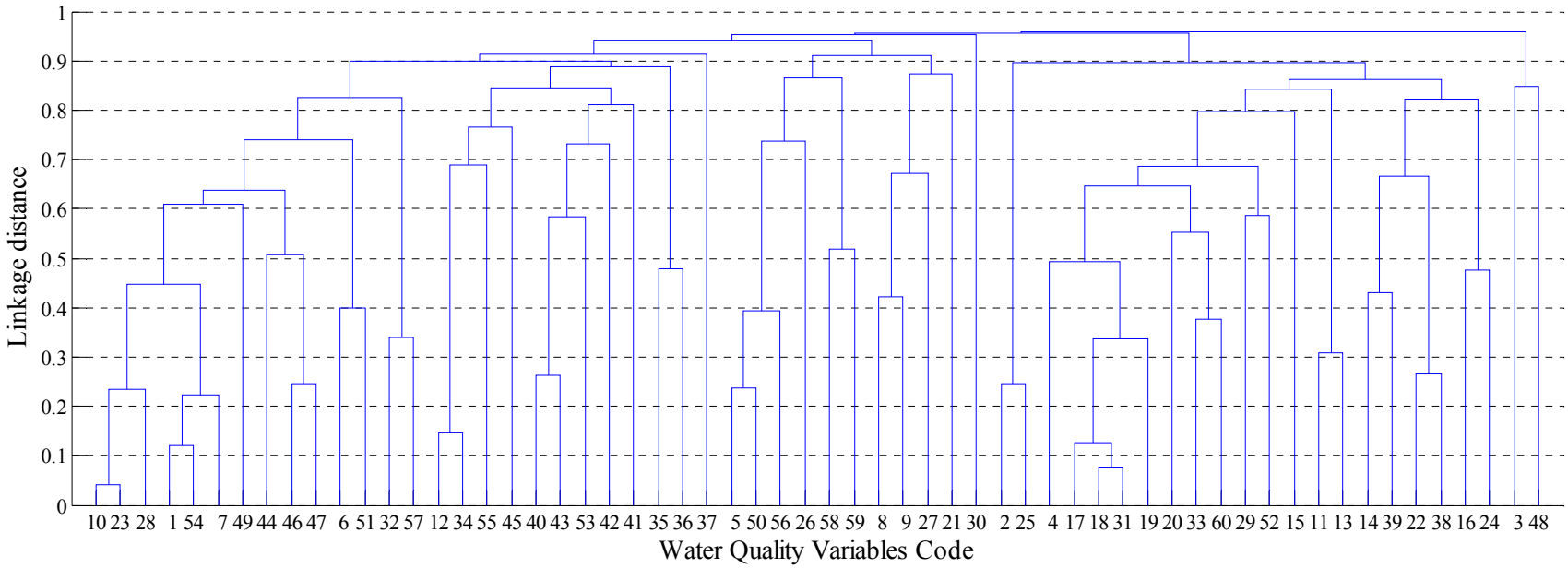


code	Water quality variables	code	Water quality variables	code	Water quality variables
1	ALKALINITY TOTAL CACO3	21	COPPER TOTAL	41	PHOSPHOROUS TOTAL
2	ALUMINUM DISSOLVED	22	FLUORIDE DISSOLVED	42	PHOSPHOROUS TOTAL DISSOLVED
3	ALUMINUM TOTAL	23	FREE CO2 (CALCD.)	43	POTASSIUM DISSOLVED
4	AMMONIA DISSOLVED	24	HARDNESS TOTAL CACO3	44	RESIDUE FIXED NONFILTRABLE
5	ARSENIC DISSOLVED	25	IRON DISSOLVED	45	RESIDUE NONFILTRABLE
6	ARSENIC TOTAL	26	IRON TOTAL	46	SIO2
7	BARIUM DISSOLVED	27	LEAD TOTAL	47	SODIUM ADSORPTION RATIO
8	BARIUM TOTAL	28	LITHIUM DISSOLVED	48	SODIUM DISSOLVED/FILTERED
9	BICARBONATE (CALCD.)	29	LITHIUM TOTAL	49	SODIUM PERCENTAGE
10	BORON DISSOLVED	30	MAGNESIUM DISSOLVED/FILTERED	50	SPECIFIC CONDUCTANCE
11	CADMIUM TOTAL	31	MANGANESE DISSOLVED	51	STRONTIUM DISSOLVED
12	CALCIUM DISSOLVED/FILTERED	32	MANGANESE TOTAL	52	STRONTIUM TOTAL
13	CARBON DISSOLVED ORGANIC	33	MOLYBDENUM TOTAL	53	SULPHATE DISSOLVED
14	CARBON PARTICULATE ORGANIC	34	NICKEL TOTAL	54	TEMPERATURE WATER
15	CARBON TOTAL ORGANIC	35	NITROGEN DISSOLVED NO3 & NO2	55	TOTAL DISSOLVED SOLIDS
16	CHLORIDE DISSOLVED	36	NITROGEN PARTICULATE	56	TURBIDITY
17	CHROMIUM TOTAL	37	NITROGEN TOTAL (CALCD.)	57	VANADIUM TOTAL
18	COBALT TOTAL	38	NITROGEN TOTAL DISSOLVED	58	ZINC TOTAL
19	COLOUR TRUE	39	OXYGEN DISSOLVED	59	pH
20	COPPER DISSOLVED	40	PHOSPHOROUS PARTICULATE		

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
Calcium dissolved	Alkalinity Total CaCO3	0.931	226	0.0487	5.015
Alkalinity Total CaCO3	Calcium dissolved	0.931	226	0.0487	5.015
Sodium Dissolved	Alkalinity Total CaCO3	0.9146	226	0.0489	5.015
Specific Conductance	Carbon dissolved Organic	0.909	225	0.0491	5.016
Potassium Dissolved	Alkalinity Total CaCO3	0.8655	226	0.0494	5.016
Magnesium Dissolved	Calcium dissolved	0.9671	218	0.05	5.016
Oxygen dissolved	Water Temperature	-0.7669	210	0.0539	5.024
Water Temperature	Oxygen dissolved	-0.7669	210	0.0539	5.025
Nitrogen Total	Nitrogen Total Dissolved	0.9188	195	0.0559	5.026
Nitrogen Total Dissolved	Nitrogen Total	0.9188	195	0.0559	5.028
Phosphorus Particulate	Phosphorous Tota;	0.9839	173	0.0612	5.034
Nitrogen Particulate	Carbon Particulate Organic	0.8077	185	0.0602	5.034
Carbon Particulate Organic	Nitrogen Particulate	0.8077	185	0.0602	5.035
Carbon Total Organic	Carbon dissolved Organic	0.9953	163	0.0643	5.038
Bicarbonate	Alkalinity Total CaCO3	0.999	162	0.0645	5.038
Hardness Total CaCO3	Calcium dissolved	0.9971	162	0.0646	5.038
Total Dissolved Solids	Calcium dissolved	0.9715	161	0.0655	5.040
Phosphorous Total	Phosphorus Particulate	0.9839	173	0.0612	5.041
Carbon dissolved Organic	Carbon Total Organic	0.9953	163	0.0643	5.043
Sodium Adsorption ratio	Lithium Dissolved	0.779	31	0.1252	5.055
Residue fixed nonfiltrable	Residue nonfiltrable	0.8263	143	0.0761	5.056
Residue nonfiltrable	Residue fixed nonfiltrable	0.8263	143	0.0761	5.066
Lithium Dissolved	Sodium Adsorption ratio	0.779	31	0.1252	5.074
Arsenic Total	Iron Total	0.8944	32	0.15	5.091

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
Iron Total	Arsenic Total	0.8944	32	0.15	5.108
Nickel Total	Chromium Total	0.9514	75	0.126	5.117
Aluminum Total	Vanadium Total	0.9122	70	0.1376	5.122
Chromium Total	Nickel Total	0.9514	75	0.126	5.124
Strontium Dissolved	Arsenic Total	0.9247	32	0.1677	5.130
Vanadium Total	Aluminum Total	0.9122	70	0.1376	5.131
Strontium Total	Arsenic Total	0.9273	32	0.1692	5.132
Barium Dissolved	Arsenic Total	0.9393	32	0.1764	5.141
Lithium Total	Sodium Adsorption ratio	0.931	31	0.1867	5.153
Cobalt Total	Boron Dissolved	0.8107	58	0.1784	5.165
Barium Total	Arsenic Total	0.9399	32	0.1768	5.173
Boron Dissolved	Cobalt Total	0.8107	58	0.1784	5.211
Arsenic Dissolved	Barium Total	0.9884	25	0.2444	5.249
Molybdenum Total	Sulphate Dissolved	0.9599	37	0.3272	5.286
Sulphate Dissolved	Molybdenum Total	0.9599	37	0.3272	5.366
Aluminum Dissolved	Nitrogen Dissolved NO3 & NO2	-0.7652	9	0.5869	5.495
Nitrogen Dissolved NO3 & NO2	Aluminum Dissolved	-0.7652	9	0.5869	5.534

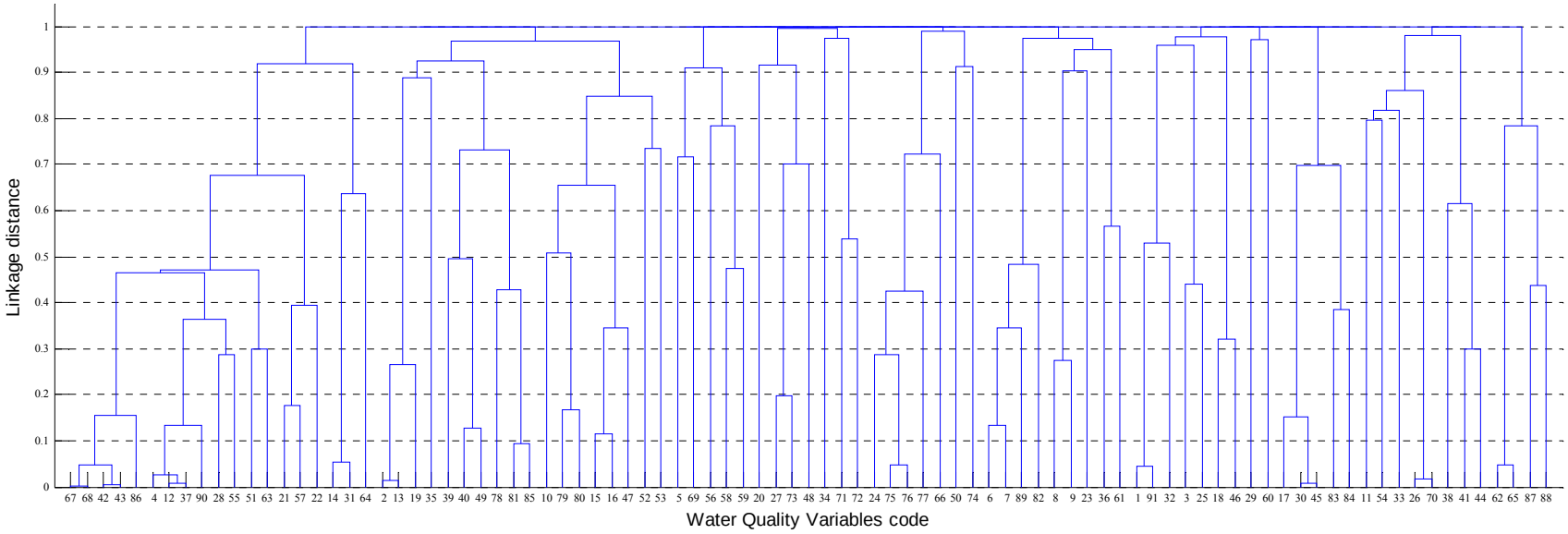
Cold River SA06AF0001 (SASK_2)



code	Water Quality Variables	code	Water Quality Variables	code	Water Quality Variables
1	ALKALINITY TOTAL CACO3	21	FLUORIDE DISSOLVED	41	PHOSPHOROUS PARTICULATE
2	ALUMINUM TOTAL	22	FREE CO2	42	PHOSPHOROUS TOTAL
3	AMMONIA DISSOLVED	23	HARDNESS TOTAL CACO3	43	PHOSPHOROUS TOTAL DISSOLVED
4	ARSENIC TOTAL	24	IRON DISSOLVED	44	POTASSIUM DISSOLVED/FILTERED
5	BARIUM DISSOLVED	25	IRON TOTAL	45	RESIDUE NONFILTRABLE
6	BARIUM TOTAL	26	LITHIUM DISSOLVED	46	SODIUM ADSORPTION RATIO
7	BICARBONATE	27	LITHIUM TOTAL	47	SODIUM DISSOLVED/FILTERED
8	BORON DISSOLVED	28	MAGNESIUM DISSOLVED/FILTERED	48	SODIUM PERCENTAGE (CALCD.)
9	BORON TOTAL	29	MANGANESE DISSOLVED	49	SPECIFIC CONDUCTANCE
10	CALCIUM DISSOLVED	30	MANGANESE TOTAL	50	STRONTIUM DISSOLVED
11	CARBON DISSOLVED ORGANIC	31	MOLYBDENUM DISSOLVED	51	STRONTIUM TOTAL
12	CARBON PARTICULATE ORGANIC	32	MOLYBDENUM TOTAL	52	SULPHATE DISSOLVED
13	CARBON TOTAL ORGANIC	33	NICKEL TOTAL	53	TEMPERATURE WATER
14	CARBONATE	34	NITROGEN PARTICULATE	54	TOTAL DISSOLVED SOLIDS
15	CHLORIDE DISSOLVED	35	NITROGEN TOTAL (CALCD.)	55	TURBIDITY
16	CHROMIUM DISSOLVED	36	NITROGEN TOTAL DISSOLVED	56	URANIUM DISSOLVED
17	CHROMIUM TOTAL	37	OXYGEN DISSOLVED	57	URANIUM TOTAL
18	COBALT TOTAL	38	pH	58	VANADIUM DISSOLVED
19	COPPER DISSOLVED	39	pH field	59	VANADIUM TOTAL
20	COPPER TOTAL	40	PHOSPHOROUS DISSOLVED ORTHO	60	ZINC TOTAL

Discontinued Variable	Best-auxiliary	r	n_1	var(u)	I_a
Calcium Dissolved	Hardness Total CaCO3	0.9795	83	0.1138	6.919
Hardness Total	Calcium Dissolved	0.9795	83	0.1138	6.919
Molybdenum Dissolved	Cobalt Total	0.9623	34	0.1529	6.924
Magnesium Dissolved/Filtered	Hardness Total CaCO3	0.9218	83	0.1183	6.925
Total Dissolved Solids	Alkalinity Total CaCO3	0.938	78	0.1232	6.930
Alkalinity Total CaCO3	Total Dissolved Solids	0.938	78	0.1232	6.932
Bicarbonate	Alkalinity Total CaCO3	0.8717	81	0.1246	6.933
pH	Free CO2	-0.8564	78	0.1301	6.940
Free CO2	pH	-0.8564	78	0.1301	6.942
Copper Dissolved	Molybdenum Dissolved	0.7488	28	0.1873	6.950
Cobalt Total	Molybdenum Dissolved	0.9623	34	0.1529	6.953
Carbon Particulate Organic	Nitrogen Particulate	0.9245	57	0.1624	6.966
Nitrogen Particulate	Carbon Particulate Organic	0.9245	57	0.1624	6.967
Chromium Total	Cobalt Total	0.9181	29	0.2054	6.982
Carbon Total Organic	Carbon Dissolved Organic	0.8319	57	0.1783	6.985
Carbon Dissolved Organic	Carbon Total Organic	0.8319	57	0.1783	6.989
Strontium Dissolved	Barium Dissolved	0.8734	46	0.2181	7.018
Barium Dissolved	Strontium Dissolved	0.8734	46	0.2181	7.018
Iron Total	Aluminum Total	0.8683	40	0.2982	7.097
Sodium Adsorption ration	Sodium Dissolved	0.8687	39	0.3343	7.119
Aluminum Total	Iron Total	0.8683	40	0.2982	7.120
Sodium Dissolved	Sodium Adsorption ration	0.8687	39	0.3343	7.159

Qu’appelle River SA05JM0014 (SASK_3)



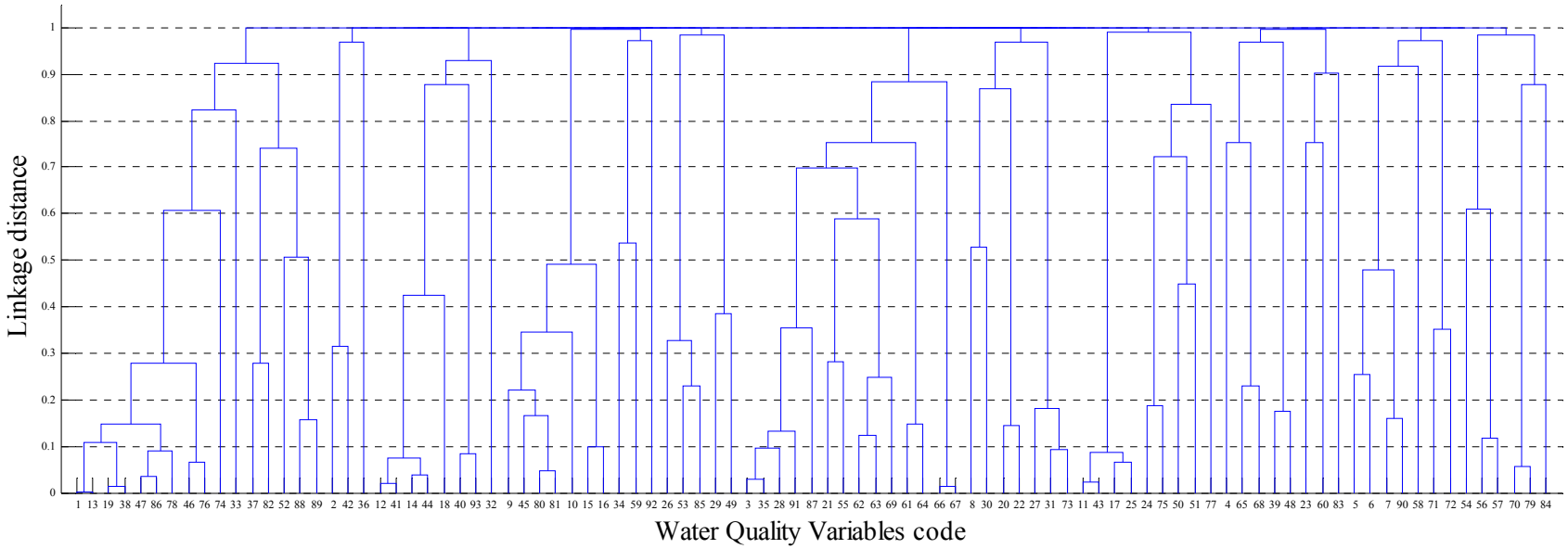
code	Water quality variables	code	Water quality variables	code	Water quality variables
1	2,4-D	32	COPPER DISSOLVED	63	PHOSPHOROUS PARTICULATE
2	ALKALINITY TOTAL CACO3	33	COPPER TOTAL	64	PHOSPHOROUS TOTAL
3	ALUMINUM DISSOLVED	34	E. COLI	65	PHOSPHOROUS TOTAL DISSOLVED
4	ALUMINUM TOTAL	35	FLUORIDE DISSOLVED	66	POTASSIUM DISSOLVED/FILTERED
5	AMMONIA DISSOLVED	36	FREE CO2 (CALCD.)	67	RESIDUE FIXED NONFILTRABLE
6	ANTIMONY DISSOLVED	37	GALLIUM TOTAL	68	RESIDUE NONFILTRABLE
7	ANTIMONY TOTAL	38	GALLIUM, DISSOLVED	69	RUBIDIUM DISSOLVED
8	ARSENIC DISSOLVED	39	HARDNESS NON-CARB.	70	RUBIDIUM TOTAL
9	ARSENIC TOTAL	40	HARDNESS TOTAL CaCO3	71	SELENIUM DISSOLVED
10	BARIUM DISSOLVED	41	IRON DISSOLVED	72	SELENIUM TOTAL
11	BARIUM TOTAL	42	IRON TOTAL	73	SILVER TOTAL
12	BERYLLIUM TOTAL	43	LANTHANUM TOTAL	74	SIO2
13	BICARBONATE (CALCD.)	44	LANTHANUM, DISSOLVED	75	SODIUM ADSORPTION RATIO
14	BISMUTH TOTAL	45	LEAD DISSOLVED	76	SODIUM DISSOLVED/FILTERED
15	BORON DISSOLVED	46	LEAD TOTAL	77	SODIUM PERCENTAGE
16	BORON TOTAL	47	LITHIUM DISSOLVED	78	SPECIFIC CONDUCTANCE
17	CADMIUM DISSOLVED	48	LITHIUM TOTAL	79	STRONTIUM DISSOLVED
18	CADMIUM TOTAL	49	MAGNESIUM DISSOLVED/FILTERED	80	STRONTIUM TOTAL
19	CALCIUM DISSOLVED	50	MANGANESE DISSOLVED	81	SULPHATE DISSOLVED
20	CARBON DISSOLVED ORGANIC	51	MANGANESE TOTAL	82	TEMPERATURE WATER
21	CARBON PARTICULATE ORGANIC	52	MOLYBDENUM DISSOLVED	83	THALLIUM DISSOLVED
22	CARBON TOTAL ORGANIC (CALCD.)	53	MOLYBDENUM TOTAL	84	THALLIUM TOTAL
23	CARBONATE (CALCD.)	54	NICKEL DISSOLVED	85	TOTAL DISSOLVED SOLIDS
24	CHLORIDE DISSOLVED	55	NICKEL TOTAL	86	TURBIDITY
25	CHROMIUM DISSOLVED	56	NITROGEN DISSOLVED NO3 & NO2	87	URANIUM DISSOLVED

26	CHROMIUM TOTAL	57	NITROGEN PARTICULATE	88	URANIUM TOTAL
27	COBALT DISSOLVED	58	NITROGEN TOTAL	89	VANADIUM DISSOLVED
28	COBALT TOTAL	59	NITROGEN TOTAL DISSOLVED	90	VANADIUM TOTAL
29	COLIFORMS FECAL	60	OXYGEN DISSOLVED	91	ZINC DISSOLVED
30	COLIFORMS TOTAL	61	pH	92	ZINC TOTAL
31	COLOUR TRUE	62	PHOSPHOROUS DISSOLVED ORTHO		

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
Turbidity	Residue nonfiltrable	0.9256	380	0.03	6.661
Residue nonfiltrable	Turbidity	0.9256	380	0.03	6.661
Residue fixed nonfiltrable	Residue nonfiltrable	0.9986	372	0.0303	6.662
Nitrogen Particulate	Carbon Particulate Organic	0.9075	353	0.0322	6.666
Carbon Particulate Organic	Nitrogen Particulate	0.9075	353	0.0322	6.666
Alkalinity Total CaCO3	Calcium Dissolved	0.8566	346	0.0331	6.668
Calcium Dissolved	Alkalinity Total CaCO3	0.8566	346	0.0331	6.668
Sodium Dissolved	Chloride Dissolved	0.8558	342	0.0334	6.669
Chloride Dissolved	Sodium Dissolved	0.8558	342	0.0334	6.669
Hardness Total CaCO3	Magnesium Dissolved /filtered	0.9346	311	0.0362	6.674
Magnesium Dissolved /filtered	Hardness Total CaCO3	0.9346	311	0.0362	6.676
Bicarbonate	Alkalinity Total CaCO3	0.9925	278	0.0398	6.680
Total Dissolved Solids	Sulphate Dissolved	0.9527	277	0.0402	6.681
Sulphate Dissolved	Total Dissolved Solids	0.9527	277	0.0402	6.686
Phosphorous Dissolved Ortho	Phosphorous Total Dissolved	0.9756	212	0.0511	6.700
Phosphorous Total Dissolved	Phosphorous Dissolved Ortho	0.9756	212	0.0511	6.714
Cobalt Total	Nickel Total	0.845	184	0.06	6.715
Nickel Total	Cobalt Total	0.845	184	0.06	6.720
Aluminum Total	Vanadium Total	0.9316	135	0.0775	6.738
Vanadium Total	Aluminum Total	0.9316	135	0.0775	6.753
Cadmium Total	Lead Total	0.8244	118	0.0908	6.762
Lead Total	Cadmium Total	0.8244	118	0.0908	6.766
Iron Total	Residue fixed nonfiltrable	0.9767	80	0.1174	6.781
Sodium Adsorption ratio	Sodium Dissolved	0.9756	72	0.1277	6.791

Discontinued Variable	Best-auxiliary	r	n_1	$var(u)$	I_a
Strontium Dissolved	Strontium Total	0.9117	76	0.1283	6.794
Strontium Total	Strontium Dissolved	0.9117	76	0.1283	6.797
Beryllium Total	Aluminum Total	0.9863	65	0.1367	6.798
Lanthanum Total	Iron Total	0.9979	60	0.1432	6.803
Gallium Total	Beryllium Total	0.996	60	0.1435	6.803
Rubidium Total	Chromium Total	0.9912	60	0.1444	6.804
Boron Total	Boron Dissolved	0.9406	64	0.1448	6.808
Antimony Total	Antimony Dissolved	0.931	60	0.1543	6.817
Antimony Dissolved	Antimony Total	0.931	60	0.1543	6.817
Manganese Total	Phosphorous Particulate	0.8376	69	0.1473	6.822
Lead Dissolved	Cadmium Dissolved	0.9205	57	0.1631	6.825
Cadmium Dissolved	Lead Dissolved	0.9205	57	0.1631	6.829
Lanthanum Dissolved	Iron Dissolved	0.8373	60	0.1685	6.835
Arsenic Total	Arsenic Dissolved	0.8518	60	0.1664	6.841
Silver Total	Cobalt Dissolved	0.8958	54	0.1764	6.841
Chromium Total	Rubidium Total	0.9912	60	0.1444	6.851
Cobalt Dissolved	Silver Total	0.8958	54	0.1764	6.853
Boron Dissolved	Boron Total	0.9406	64	0.1448	6.864
Phosphorous Particulate	Manganese Total	0.8376	69	0.1473	6.871
Iron Dissolved	Lanthanum Dissolved	0.8373	60	0.1685	6.880
Arsenic Dissolved	Arsenic Total	0.8518	60	0.1664	6.884
Zinc Dissolved	2,4-D	0.9777	10	0.373	7.041
2,4-D	Zinc Dissolved	0.9777	10	0.373	7.056
Bismuth Total	Colour	0.9732	4	0.5137	7.140
Coliforms Total	Lead Dissolved	0.9963	3	0.461	7.152
Colour	Bismuth Total	0.9732	4	0.5137	7.195

Red Deer River SA05LC0001 (SASK_4)



code	Water quality variables	code	Water quality variables	code	Water quality variables
1	ALKALINITY TOTAL CACO3	32	COPPER TOTAL	63	PHOSPHOROUS TOTAL
2	ALUMINUM DISSOLVED	33	FLUORIDE DISSOLVED	64	PHOSPHOROUS TOTAL DISSOLVED
3	ALUMINUM TOTAL	34	FREE CO2 (CALCD.)	65	POTASSIUM DISSOLVED/FILTERED
4	AMMONIA DISSOLVED	35	GALLIUM TOTAL	66	BERYLLIUM TOTAL
5	ANTIMONY DISSOLVED	36	GALLIUM, DISSOLVED	67	RESIDUE NONFILTRABLE
6	ANTIMONY TOTAL	37	HARDNESS NON-CARB. (CALCD.)	68	RUBIDIUM DISSOLVED
7	ARSENIC DISSOLVED	38	HARDNESS TOTAL CACO3	69	RUBIDIUM TOTAL
8	ARSENIC TOTAL	39	IRON DISSOLVED	70	SATURATION INDEX (CALCD.)
9	BARIUM DISSOLVED	40	IRON TOTAL	71	SELENIUM DISSOLVED
10	BARIUM TOTAL	41	LANTHANUM TOTAL	72	SELENIUM TOTAL
11	BERYLLIUM DISSOLVED	42	LANTHANUM DISSOLVED	73	SILVER TOTAL
12	BERYLLIUM TOTAL	43	LEAD DISSOLVED	74	SIO2
13	BICARBONATE (CALCD.)	44	LEAD TOTAL	75	SODIUM ADSORPTION RATIO
14	BISMUTH TOTAL	45	LITHIUM DISSOLVED	76	SODIUM DISSOLVED/FILTERED
15	BORON DISSOLVED	46	LITHIUM TOTAL	77	SODIUM PERCENTAGE
16	BORON TOTAL	47	MAGNESIUM DISSOLVED/FILTERED	78	SPECIFIC CONDUCTANCE
17	CADMIUM DISSOLVED	48	MANGANESE DISSOLVED	79	STABILITY INDEX (CALCD.)
18	CADMIUM TOTAL	49	MANGANESE TOTAL	80	STRONTIUM DISSOLVED
19	CALCIUM DISSOLVED/FILTERED	50	MOLYBDENUM DISSOLVED	81	STRONTIUM TOTAL
20	CARBON DISSOLVED ORGANIC	51	MOLYBDENUM TOTAL	82	SULPHATE DISSOLVED
21	CARBON PARTICULATE ORGANIC	52	NICKEL DISSOLVED	83	TEMPERATURE WATER
22	CARBON TOTAL ORGANIC (CALCD.)	53	NICKEL TOTAL	84	THALLIUM DISSOLVED
23	CARBONATE (CALCD.)	54	NITROGEN DISSOLVED NO3 & NO2	85	THALLIUM TOTAL
24	CHLORIDE DISSOLVED	55	NITROGEN PARTICULATE	86	TOTAL DISSOLVED SOLIDS
25	CHROMIUM DISSOLVED	56	NITROGEN TOTAL (CALCD.)	87	TURBIDITY

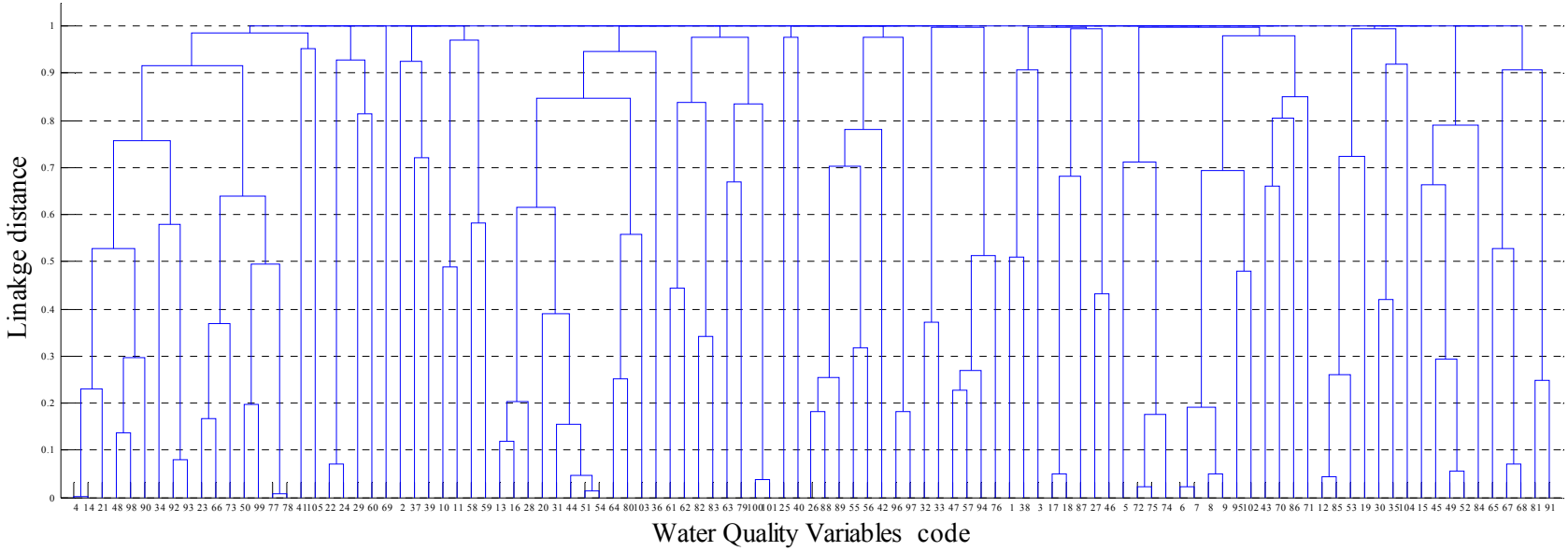
26	CHROMIUM TOTAL	57	NITROGEN TOTAL DISSOLVED	88	URANIUM DISSOLVED
27	COBALT DISSOLVED	58	OXYGEN DISSOLVED	89	URANIUM TOTAL
28	COBALT TOTAL	59	pH	90	VANADIUM DISSOLVED
29	COLIFORMS FECAL	60	pH field	91	VANADIUM TOTAL
30	COLOUR TRUE	61	PHOSPHOROUS DISSOLVED ORTHO	92	ZINC DISSOLVED
31	COPPER DISSOLVED	62	PHOSPHOROUS PARTICULATE	93	ZINC TOTAL

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
LANTHANUM DISSOLVED	ALUMINUM DISSOLVED	0.8278	34	-0.023	7.810
URANIUM TOTAL	URANIUM DISSOLVED	0.9186	35	-0.0363	7.810
URANIUM DISSOLVED	URANIUM TOTAL	0.9186	35	-0.0363	7.810
RUBIDIUM TOTAL	PHOSPHOROUS TOTAL	0.8816	35	-0.1384	7.810
THALLIUM TOTAL	NICKEL TOTAL	0.878	35	-0.148	7.810
RUBIDIUM DISSOLVED	POTASSIUM DISSOLVED/FILTERED	0.8775	35	-0.1495	7.810
ANTIMONY TOTAL	ANTIMONY DISSOLVED	0.8633	35	-0.1873	7.810
ANTIMONY DISSOLVED	ANTIMONY TOTAL	0.8633	35	-0.1873	7.810
VANADIUM DISSOLVED	ARSENIC DISSOLVED	0.916	35	-0.0436	7.822
ALUMINUM DISSOLVED	LANTHANUM DISSOLVED	0.8278	34	-0.023	7.829
ARSENIC DISSOLVED	VANADIUM DISSOLVED	0.916	35	-0.0436	7.890
POTASSIUM DISSOLVED/FILTERED	RUBIDIUM DISSOLVED	0.8775	35	-0.1495	7.905
GALLIUM TOTAL	VANADIUM TOTAL	0.941	35	0.0276	7.976
VANADIUM TOTAL	GALLIUM TOTAL	0.941	35	0.0276	8.048
SILVER TOTAL	COPPER DISSOLVED	0.9517	35	0.0588	8.061
BERYLLIUM DISSOLVED	CHROMIUM DISSOLVED	0.9549	35	0.0682	8.071
CHROMIUM DISSOLVED	BERYLLIUM DISSOLVED	0.9549	35	0.0682	8.073
COPPER DISSOLVED	SILVER TOTAL	0.9517	35	0.0588	8.078
CALCIUM DISSOLVED/FILTERED	SPECIFIC CONDUCTANCE	0.9396	360	0.0315	8.082
ALKALINITY TOTAL CACO3	CALCIUM DISSOLVED/FILTERED	0.9448	359	0.0316	8.083
SPECIFIC CONDUCTANCE	CALCIUM DISSOLVED/FILTERED	0.9396	360	0.0315	8.083
SODIUM DISSOLVED/FILTERED	SPECIFIC CONDUCTANCE	0.9073	360	0.0316	8.083
MAGNESIUM DISSOLVED/FILTERED	SPECIFIC CONDUCTANCE	0.9545	303	0.037	8.093
NITROGEN TOTAL (CALCD.)	NITROGEN TOTAL DISSOLVED	0.9397	270	0.0413	8.101

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
CADMIUM DISSOLVED	BERYLLIUM DISSOLVED	0.9602	35	0.0836	8.103
NITROGEN TOTAL DISSOLVED	NITROGEN TOTAL (CALCD.)	0.9397	270	0.0413	8.103
PHOSPHOROUS PARTICULATE	PHOSPHOROUS TOTAL	0.9365	254	0.0437	8.106
NITROGEN PARTICULATE	CARBON PARTICULATE ORGANIC	0.8484	249	0.0452	8.109
BERYLLIUM TOTAL	LEAD TOTAL	0.9625	35	0.0905	8.111
CARBON PARTICULATE ORGANIC	NITROGEN PARTICULATE	0.8484	249	0.0452	8.111
PHOSPHOROUS TOTAL	PHOSPHOROUS PARTICULATE	0.9365	254	0.0437	8.111
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED/FILTERED	0.9935	230	0.0473	8.112
TOTAL DISSOLVED SOLIDS	HARDNESS TOTAL CACO3	0.9918	227	0.0479	8.113
BICARBONATE (CALCD.)	ALKALINITY TOTAL CACO3	0.9994	225	0.0482	8.113
CARBON TOTAL ORGANIC	CARBON DISSOLVED ORGANIC	0.9256	224	0.0492	8.115
BERYLLIUM TOTAL	RESIDUE NONFILTRABLE	0.9936	214	0.0505	8.117
CARBON DISSOLVED ORGANIC	CARBON TOTAL ORGANIC	0.9256	224	0.0492	8.120
MANGANESE DISSOLVED	IRON DISSOLVED	0.9082	212	0.0519	8.121
IRON DISSOLVED	MANGANESE DISSOLVED	0.9082	212	0.0519	8.123
RESIDUE NONFILTRABLE	BERYLLIUM TOTAL	0.9936	214	0.0505	8.125
STABILITY INDEX (CALCD.)	SATURATION INDEX (CALCD.)	-0.9722	180	0.0593	8.131
SATURATION INDEX (CALCD.)	STABILITY INDEX (CALCD.)	-0.9722	180	0.0593	8.131
HARDNESS NON-CARB. (CALCD.)	SULPHATE DISSOLVED	0.8489	182	0.0606	8.133
SULPHATE DISSOLVED	HARDNESS NON-CARB. (CALCD.)	0.8489	182	0.0606	8.151
LEAD TOTAL	BERYLLIUM TOTAL	0.9625	35	0.0905	8.158
COBALT TOTAL	GALLIUM TOTAL	0.9601	35	0.0833	8.159
CHROMIUM TOTAL	NICKEL TOTAL	0.8204	112	0.0954	8.180
ALUMINUM TOTAL	VANADIUM TOTAL	0.9492	102	0.0979	8.180
LANTHANUM TOTAL	LEAD TOTAL	0.9796	35	0.1414	8.186

Discontinued Variable	**Best-auxiliary**	***r***	n_1	***var(u)***	I_a
PHOSPHOROUS DISSOLVED ORTHO	PHOSPHOROUS TOTAL DISSOLVED	0.9232	93	0.1073	8.191
COBALT DISSOLVED	SILVER TOTAL	0.9145	33	0.1354	8.195
NICKEL TOTAL	CHROMIUM TOTAL	0.8204	112	0.0954	8.197
PHOSPHOROUS TOTAL DISSOLVED	PHOSPHOROUS DISSOLVED ORTHO	0.9232	93	0.1073	8.227
LEAD DISSOLVED	BERYLLIUM DISSOLVED	0.9893	35	0.1707	8.228
STRONTIUM DISSOLVED	STRONTIUM TOTAL	0.9758	57	0.1528	8.231
LITHIUM TOTAL	SODIUM DISSOLVED/FILTERED	0.9669	58	0.1524	8.231
STRONTIUM TOTAL	STRONTIUM DISSOLVED	0.9758	57	0.1528	8.232
IRON TOTAL	ZINC TOTAL	0.957	58	0.1542	8.233
BARIUM DISSOLVED	STRONTIUM DISSOLVED	0.9395	57	0.1596	8.239
LITHIUM DISSOLVED	STRONTIUM DISSOLVED	0.9359	57	0.1603	8.240
BISMUTH TOTAL	LANTHANUM TOTAL	0.9746	32	0.1982	8.249
ZINC TOTAL	IRON TOTAL	0.957	58	0.1542	8.280
SODIUM ADSORPTION RATIO	CHLORIDE DISSOLVED	0.9013	44	0.2216	8.297
CHLORIDE DISSOLVED	SODIUM ADSORPTION RATIO	0.9013	44	0.2216	8.376

Assiniboine River SA05MD0002 (SASK_5)



code	Water quality variables	code	Water quality variables	code	Water quality variables
1	1,2,4,5-TETRABROMOBENZENE	36	COPPER TOTAL	71	pH field
2	2,3-D (SURROGATE)	37	D14 - TRIFLURALIN	72	PHOSPHOROUS DISSOLVED ORTHO
3	2,4-D	38	DELTA-BENZENEHEXACHLORIDE	73	PHOSPHOROUS PARTICULATE
4	ALKALINITY TOTAL CACO3	39	DICAMBA	74	PHOSPHOROUS TOTAL
5	AMMONIA UN-IONIZED	40	E. COLI	75	PHOSPHOROUS TOTAL DISSOLVED
6	ANTIMONY DISSOLVED	41	ENDRIN KETONE (SURROGATE).	76	POTASSIUM DISSOLVED
7	ANTIMONY TOTAL	42	FLUORIDE DISSOLVED	77	RESIDUE FIXED NONFILTRABLE
8	ARSENIC DISSOLVED	43	FREE CO2 (CALCD.)	78	RESIDUE NONFILTRABLE
9	ARSENIC TOTAL	44	GALLIUM TOTAL	79	RUBIDIUM DISSOLVED
10	BARIUM DISSOLVED	45	GALLIUM DISSOLVED	80	RUBIDIUM TOTAL
11	BARIUM TOTAL	46	GAMMA-BENZENEHEXACHLORIDE	81	SATURATION INDEX (CALCD.)
12	BERYLLIUM DISSOLVED	47	HARDNESS NON-CARB. (CALCD.)	82	SELENIUM DISSOLVED
13	BERYLLIUM TOTAL	48	HARDNESS TOTAL CACO3	83	SELENIUM TOTAL
14	BICARBONATE (CALCD.)	49	IRON DISSOLVED	84	SILVER DISSOLVED
15	BISMUTH DISSOLVED	50	IRON TOTAL	85	SILVER TOTAL
16	BISMUTH TOTAL	51	LANTHANUM TOTAL	86	SIO2
17	BORON DISSOLVED	52	LANTHANUM DISSOLVED	87	SODIUM ADSORPTION RATIO
18	BORON TOTAL	53	LEAD DISSOLVED	88	SODIUM DISSOLVED/FILTERED
19	CADMIUM DISSOLVED	54	LEAD TOTAL	89	SODIUM PERCENTAGE
20	CADMIUM TOTAL	55	LITHIUM DISSOLVED	90	SPECIFIC CONDUCTANCE
21	CALCIUM DISSOLVED/FILTERED	56	LITHIUM TOTAL	91	STABILITY INDEX (CALCD.)
22	CARBON DISSOLVED ORGANIC	57	MAGNESIUM DISSOLVED/FILTERED	92	STRONTIUM DISSOLVED
23	CARBON PARTICULATE ORGANIC	58	MANGANESE DISSOLVED	93	STRONTIUM TOTAL
24	CARBON TOTAL ORGANIC	59	MANGANESE TOTAL	94	SULPHATE DISSOLVED
25	CARBONATE (CALCD.)	60	MCPA	95	TEMPERATURE WATER

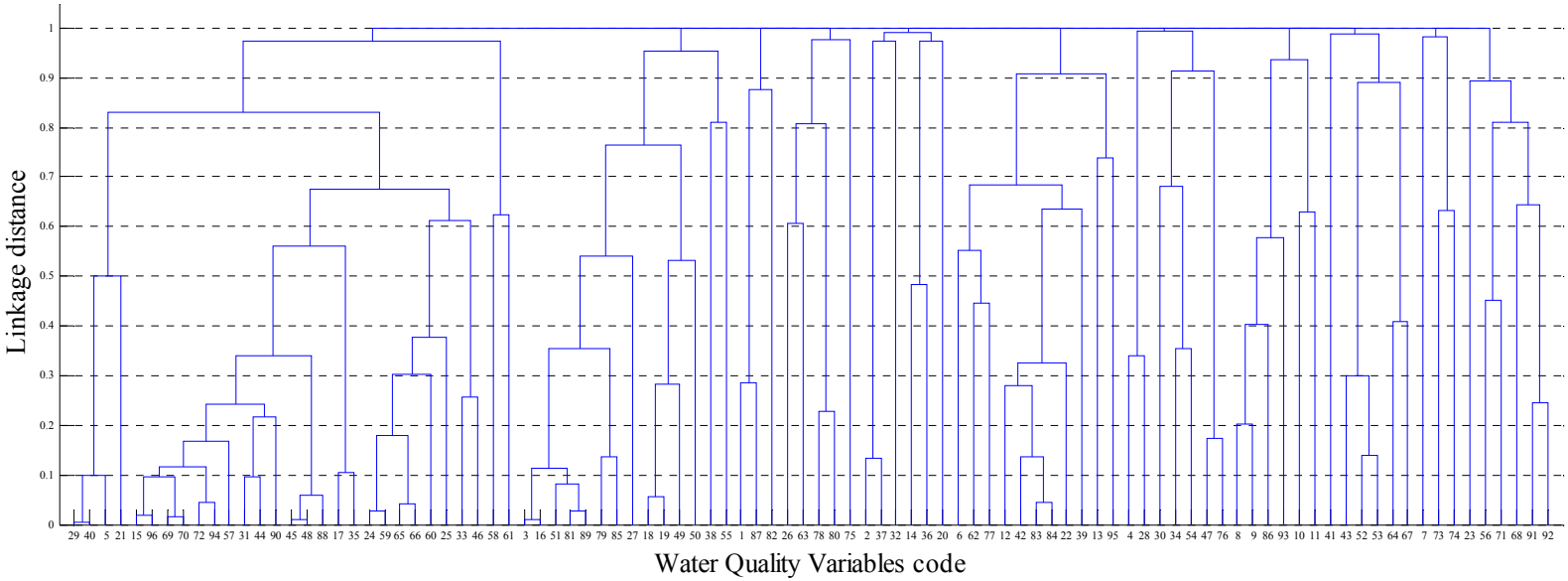
26	CHLORIDE DISSOLVED	61	MOLYBDENUM DISSOLVED	96	THALLIUM DISSOLVED
27	CHROMIUM DISSOLVED	62	MOLYBDENUM TOTAL	97	THALLIUM TOTAL
28	CHROMIUM TOTAL	63	NICKEL DISSOLVED	98	TOTAL DISSOLVED SOLIDS
29	CLOPYRALID	64	NICKEL TOTAL	99	TURBIDITY
30	COBALT DISSOLVED	65	NITROGEN DISSOLVED NO3 & NO2	100	URANIUM DISSOLVED
31	COBALT TOTAL	66	NITROGEN PARTICULATE	101	URANIUM TOTAL
32	COLIFORMS FECAL	67	NITROGEN TOTAL (CALCD.)	102	VANADIUM DISSOLVED
33	COLIFORMS TOTAL	68	NITROGEN TOTAL DISSOLVED	103	VANADIUM TOTAL
34	COLOUR TRUE	69	OXYGEN DISSOLVED	104	ZINC DISSOLVED
35	COPPER DISSOLVED	70	pH	105	ZINC TOTAL

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
CHLORIDE DISSOLVED	SODIUM DISSOLVED/FILTERED	0.904	446	0.0258	6.980
SODIUM DISSOLVED/FILTERED	CHLORIDE DISSOLVED	0.904	446	0.0258	6.980
CALCIUM DISSOLVED/FILTERED	ALKALINITY TOTAL CACO3	0.8783	446	0.0259	6.980
ALKALINITY TOTAL CACO3	CALCIUM DISSOLVED/FILTERED	0.8783	446	0.0259	6.980
HARDNESS TOTAL CACO3	SPECIFIC CONDUCTANCE	0.8395	406	0.0284	6.986
MAGNESIUM DISSOLVED/FILTERED	SULPHATE DISSOLVED	0.8552	404	0.0285	6.986
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9963	394	0.0287	6.986
PHOSPHOROUS TOTAL DISSOLVED	PHOSPHOROUS TOTAL	0.936	398	0.0287	6.986
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9963	394	0.0287	6.988
PHOSPHOROUS TOTAL	PHOSPHOROUS TOTAL DISSOLVED	0.936	398	0.0287	6.988
SPECIFIC CONDUCTANCE	HARDNESS TOTAL CACO3	0.8395	406	0.0284	6.988
SULPHATE DISSOLVED	MAGNESIUM DISSOLVED/FILTERED	0.8552	404	0.0285	6.988
NITROGEN TOTAL (CALCD.)	NITROGEN TOTAL DISSOLVED	0.9635	372	0.0304	6.990
NITROGEN PARTICULATE	CARBON PARTICULATE ORGANIC	0.9125	368	0.031	6.992
CARBON PARTICULATE ORGANIC	NITROGEN PARTICULATE	0.9125	368	0.031	6.992
NITROGEN TOTAL DISSOLVED	NITROGEN TOTAL (CALCD.)	0.9635	372	0.0304	6.992
BICARBONATE (CALCD.)	ALKALINITY TOTAL CACO3	0.9994	325	0.0344	6.998
CARBON TOTAL ORGANIC	CARBON DISSOLVED ORGANIC	0.9635	321	0.035	7.000
TOTAL DISSOLVED SOLIDS	HARDNESS TOTAL CACO3	0.9293	322	0.035	7.000
CARBON DISSOLVED ORGANIC	CARBON TOTAL ORGANIC	0.9635	321	0.035	7.003
SODIUM PERCENTAGE	SODIUM DISSOLVED/FILTERED	0.8752	285	0.0396	7.009
HARDNESS NON-CARB. (CALCD.)	MAGNESIUM DISSOLVED/FILTERED	0.8799	283	0.0399	7.009
STABILITY INDEX (CALCD.)	SATURATION INDEX (CALCD.)	-0.867	275	0.041	7.011
SATURATION INDEX (CALCD.)	STABILITY INDEX (CALCD.)	-0.867	275	0.041	7.011

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
PHOSPHOROUS DISSOLVED ORTHO	PHOSPHOROUS TOTAL DISSOLVED	0.9888	225	0.0483	7.023
LEAD TOTAL	COBALT TOTAL	0.9196	156	0.0684	7.059
COBALT TOTAL	LEAD TOTAL	0.9196	156	0.0684	7.065
STRONTIUM DISSOLVED	STRONTIUM TOTAL	0.9591	126	0.0814	7.071
STRONTIUM TOTAL	STRONTIUM DISSOLVED	0.9591	126	0.0814	7.071
IRON TOTAL	TURBIDITY	0.8953	128	0.0823	7.073
LITHIUM DISSOLVED	LITHIUM TOTAL	0.826	126	0.0855	7.078
LITHIUM TOTAL	LITHIUM DISSOLVED	0.826	126	0.0855	7.079
TURBIDITY	IRON TOTAL	0.8953	128	0.0823	7.106
BORON TOTAL	BORON DISSOLVED	0.9756	80	0.1175	7.109
BERYLLIUM TOTAL	CHROMIUM TOTAL	0.8919	88	0.1145	7.110
LANTHANUM TOTAL	LEAD TOTAL	0.9936	77	0.1194	7.111
ANTIMONY DISSOLVED	ANTIMONY TOTAL	0.9885	77	0.1199	7.111
ANTIMONY TOTAL	ANTIMONY DISSOLVED	0.9885	77	0.1199	7.111
URANIUM DISSOLVED	URANIUM TOTAL	0.9811	77	0.1206	7.112
URANIUM TOTAL	URANIUM DISSOLVED	0.9811	77	0.1206	7.112
LANTHANUM DISSOLVED	IRON DISSOLVED	0.9724	77	0.1214	7.113
GALLIUM TOTAL	LANTHANUM TOTAL	0.9772	76	0.1222	7.114
THALLIUM TOTAL	THALLIUM DISSOLVED	0.9051	77	0.1275	7.122
THALLIUM DISSOLVED	THALLIUM TOTAL	0.9051	77	0.1275	7.122
RUBIDIUM TOTAL	NICKEL TOTAL	0.8647	77	0.1309	7.127
BISMUTH TOTAL	CHROMIUM TOTAL	0.9166	72	0.1339	7.128
ARSENIC TOTAL	ARSENIC DISSOLVED	0.9751	77	0.1212	7.128
GALLIUM, DISSOLVED	LANTHANUM, DISSOLVED	0.8587	70	0.1432	7.139
CHROMIUM TOTAL	BERYLLIUM TOTAL	0.8919	88	0.1145	7.142

Discontinued Variable	**Best-auxiliary**	***r***	n_1	***var(u)***	I_a
BERYLLIUM DISSOLVED	LEAD DISSOLVED	0.8648	62	0.1594	7.154
ARSENIC DISSOLVED	ARSENIC TOTAL	0.9751	77	0.1212	7.157
IRON DISSOLVED	LANTHANUM, DISSOLVED	0.9724	77	0.1214	7.159
BORON DISSOLVED	BORON TOTAL	0.9756	80	0.1175	7.159
LEAD DISSOLVED	BERYLLIUM DISSOLVED	0.8648	62	0.1594	7.164
NICKEL TOTAL	RUBIDIUM TOTAL	0.8647	77	0.1309	7.171
SILVER TOTAL	LEAD DISSOLVED	0.8598	61	0.1626	7.179

Battle River SA05FE0001 (SASK_6)



code	Water quality variables	code	Water quality variables	code	Water quality variables
1	1,2,4,5-TETRABROMOBENZENE	33	COLOUR TRUE	65	PHOSPHOROUS PARTICULATE
2	2,4-D	34	COPPER DISSOLVED	66	PHOSPHOROUS TOTAL
3	ALKALINITY TOTAL CACO3	35	COPPER TOTAL	67	PHOSPHOROUS TOTAL DISSOLVED
4	ALUMINUM DISSOLVED	36	DELTA-BENZENEHEXACHLORIDE	68	POTASSIUM DISSOLVED/FILTERED
5	ALUMINUM TOTAL	37	E. COLI	69	RESIDUE FIXED NONFILTRABLE
6	AMMONIA DISSOLVED	38	FLUORIDE DISSOLVED	70	RESIDUE NONFILTRABLE
7	AMMONIA UN-IONIZED	39	FREE CO2 (CALCD.)	71	RUBIDIUM DISSOLVED
8	ANTIMONY DISSOLVED	40	GALLIUM TOTAL	72	RUBIDIUM TOTAL
9	ANTIMONY TOTAL	41	GALLIUM DISSOLVED	73	SELENIUM DISSOLVED
10	ARSENIC DISSOLVED	42	HARDNESS TOTAL CACO3	74	SELENIUM TOTAL
11	ARSENIC TOTAL	43	IRON DISSOLVED	75	SILVER DISSOLVED
12	BARIUM DISSOLVED	44	IRON TOTAL	76	SILVER TOTAL
13	BARIUM TOTAL	45	LANTHANUM TOTAL	77	SIO2
14	BERYLLIUM DISSOLVED	46	LANTHANUM DISSOLVED	78	SODIUM ADSORPTION RATIO
15	BERYLLIUM TOTAL	47	LEAD DISSOLVED	79	SODIUM DISSOLVED/FILTERED
16	BICARBONATE (CALCD.)	48	LEAD TOTAL	80	SODIUM PERCENTAGE
17	BISMUTH TOTAL	49	LITHIUM DISSOLVED	81	SPECIFIC CONDUCTANCE
18	BORON DISSOLVED	50	LITHIUM TOTAL	82	STABILITY INDEX (CALCD.)
19	BORON TOTAL	51	MAGNESIUM DISSOLVED/FILTERED	83	STRONTIUM DISSOLVED
20	CADMIUM DISSOLVED	52	MANGANESE DISSOLVED	84	STRONTIUM TOTAL
21	CADMIUM TOTAL	53	MANGANESE TOTAL	85	SULPHATE DISSOLVED
22	CALCIUM DISSOLVED	54	MOLYBDENUM DISSOLVED	86	TEMPERATURE WATER
23	CARBON DISSOLVED ORGANIC	55	MOLYBDENUM TOTAL	87	THALLIUM DISSOLVED
24	CARBON PARTICULATE ORGANIC	56	NICKEL DISSOLVED	88	THALLIUM TOTAL
25	CARBON TOTAL ORGANIC	57	NICKEL TOTAL	89	TOTAL DISSOLVED SOLIDS

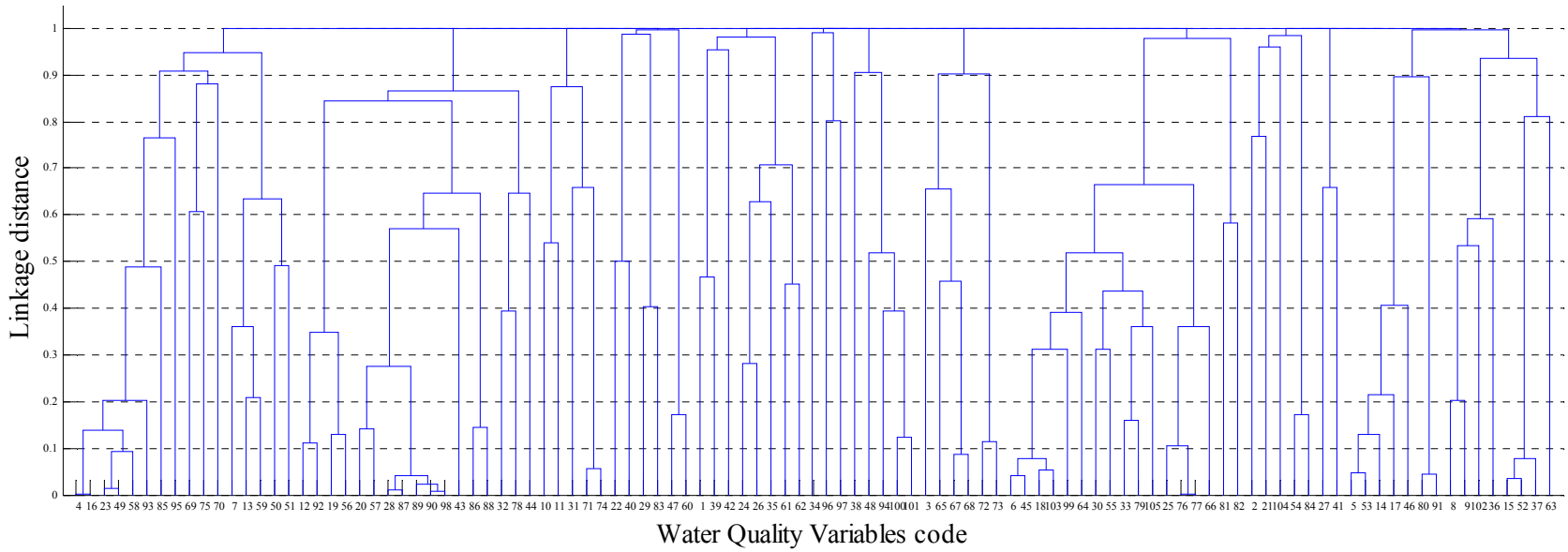
26	CARBONATE (CALCD.)	58	NITROGEN DISSOLVED NO3 & NO2	90	TURBIDITY
27	CHLORIDE DISSOLVED	59	NITROGEN PARTICULATE	91	URANIUM DISSOLVED
28	CHROMIUM DISSOLVED	60	NITROGEN TOTAL	92	URANIUM TOTAL
29	CHROMIUM TOTAL	61	NITROGEN TOTAL DISSOLVED	93	VANADIUM DISSOLVED
30	COBALT DISSOLVED	62	OXYGEN DISSOLVED	94	VANADIUM TOTAL
31	COBALT TOTAL	63	pH	95	ZINC DISSOLVED
32	COLIFORMS FECAL	64	PHOSPHOROUS DISSOLVED ORTHO	96	ZINC TOTAL

Discontinued Variable	Best-auxilary	*r*	n_1	*var(u)*	I_a
SULPHATE DISSOLVED	SODIUM DISSOLVED/FILTERED	0.9292	503	0.0229	6.078
SODIUM DISSOLVED/FILTERED	SULPHATE DISSOLVED	0.9292	503	0.0229	6.078
ALKALINITY TOTAL CACO3	SPECIFIC CONDUCTANCE	0.9421	502	0.0229	6.078
SPECIFIC CONDUCTANCE	ALKALINITY TOTAL CACO3	0.9421	502	0.0229	6.078
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED	0.9187	467	0.0246	6.082
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.9187	467	0.0246	6.084
RESIDUE NONFILTRABLE	TURBIDITY	0.8697	447	0.0258	6.085
TURBIDITY	RESIDUE NONFILTRABLE	0.8697	447	0.0258	6.087
MAGNESIUM DISSOLVED/FILTERED	SPECIFIC CONDUCTANCE	0.9575	416	0.0274	6.089
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9927	412	0.0275	6.089
PHOSPHOROUS PARTICULATE	PHOSPHOROUS TOTAL	0.9786	402	0.0282	6.090
PHOSPHOROUS TOTAL	PHOSPHOROUS PARTICULATE	0.9786	402	0.0282	6.092
NITROGEN PARTICULATE	CARBON PARTICULATE ORGANIC	0.9864	381	0.0297	6.094
CARBON PARTICULATE ORGANIC	NITROGEN PARTICULATE	0.9864	381	0.0297	6.094
NITROGEN TOTAL	PHOSPHOROUS TOTAL	0.8521	380	0.0302	6.095
BICARBONATE (CALCD.)	ALKALINITY TOTAL CACO3	0.9954	348	0.0323	6.099
TOTAL DISSOLVED SOLIDS	ALKALINITY TOTAL CACO3	0.9684	348	0.0324	6.099
NICKEL TOTAL	RESIDUE NONFILTRABLE	0.9117	321	0.0352	6.105
ZINC TOTAL	RESIDUE NONFILTRABLE	0.9515	317	0.0355	6.105
MANGANESE DISSOLVED	IRON DISSOLVED	0.8369	324	0.0353	6.106
IRON DISSOLVED	MANGANESE DISSOLVED	0.8369	324	0.0353	6.108
VANADIUM TOTAL	RESIDUE NONFILTRABLE	0.9422	298	0.0376	6.110
COBALT TOTAL	NICKEL TOTAL	0.8999	268	0.0418	6.118
ALUMINUM TOTAL	CHROMIUM TOTAL	0.9485	174	0.0615	6.154

Discontinued Variable	**Best-auxilary**	***r***	n_1	***var(u)***	I_a
CHROMIUM TOTAL	ALUMINUM TOTAL	0.9485	174	0.0615	6.160
STRONTIUM DISSOLVED	STRONTIUM TOTAL	0.9776	135	0.0761	6.169
STRONTIUM TOTAL	STRONTIUM DISSOLVED	0.9776	135	0.0761	6.169
IRON TOTAL	TURBIDITY	0.9355	137	0.0764	6.170
MANGANESE TOTAL	MANGANESE DISSOLVED	0.9284	137	0.0766	6.170
LITHIUM DISSOLVED	BORON DISSOLVED	0.9032	135	0.0782	6.172
BARIUM DISSOLVED	STRONTIUM DISSOLVED	0.8878	135	0.0787	6.173
SODIUM ADSORPTION RATIO	SODIUM PERCENTAGE	0.8792	120	0.0877	6.185
BERYLLIUM TOTAL	ZINC TOTAL	0.99	97	0.0998	6.196
BORON DISSOLVED	LITHIUM DISSOLVED	0.9032	135	0.0782	6.202
GALLIUM TOTAL	ALUMINUM TOTAL	0.9963	86	0.1094	6.206
LANTHANUM TOTAL	LEAD TOTAL	0.9949	86	0.1095	6.206
BORON TOTAL	BORON DISSOLVED	0.9718	88	0.1091	6.206
RUBIDIUM TOTAL	VANADIUM TOTAL	0.9776	86	0.1108	6.208
THALLIUM TOTAL	LEAD TOTAL	0.9722	85	0.1122	6.209
SODIUM PERCENTAGE	SODIUM ADSORPTION RATIO	0.8792	120	0.0877	6.212
ANTIMONY TOTAL	ANTIMONY DISSOLVED	0.8939	86	0.1167	6.216
ANTIMONY DISSOLVED	ANTIMONY TOTAL	0.8939	86	0.1167	6.216
URANIUM TOTAL	URANIUM DISSOLVED	0.8688	86	0.1183	6.219
URANIUM DISSOLVED	URANIUM TOTAL	0.8688	86	0.1183	6.219
BISMUTH TOTAL	COPPER TOTAL	0.9455	77	0.1239	6.222
LEAD TOTAL	LANTHANUM TOTAL	0.9949	86	0.1095	6.238
LEAD DISSOLVED	SILVER TOTAL	0.9092	72	0.1346	6.244

Discontinued Variable	**Best-auxilary**	***r***	n_1	***var(u)***	I_a
SILVER TOTAL	LEAD DISSOLVED	0.9092	72	0.1346	6.246
COPPER TOTAL	BISMUTH TOTAL	0.9455	77	0.1239	6.269
LANTHANUM DISSOLVED	COLOUR TRUE	0.8629	24	0.25	6.375
COLOUR TRUE	LANTHANUM DISSOLVED	0.8629	24	0.25	6.415

Carrot River SA05KH0002 (SASK_7)



Code	Water quality variables	Code	Water quality variables	Code	Water quality variables
1	1,2,4,5-TETRABROMOBENZENE.	36	COPPER DISSOLVED	71	PHOSPHOROUS DISSOLVED ORTHO
2	2,3-D (SURROGATE)	37	COPPER TOTAL	72	PHOSPHOROUS PARTICULATE
3	2,4-D	38	D14 - TRIFLURALIN	73	PHOSPHOROUS TOTAL
4	ALKALINITY TOTAL CACO3	39	DELTA-BENZENEHEXACHLORIDE	74	PHOSPHOROUS TOTAL DISSOLVED
5	ALUMINUM DISSOLVED	40	DICAMBA	75	POTASSIUM DISSOLVED/FILTERED
6	ALUMINUM TOTAL	41	E. COLI	76	RESIDUE FIXED NONFILTRABLE
7	AMMONIA DISSOLVED	42	ENDRIN KETONE	77	RESIDUE NONFILTRABLE
8	ANTIMONY DISSOLVED	43	FLUORIDE DISSOLVED	78	RUBIDIUM DISSOLVED
9	ANTIMONY TOTAL	44	FREE CO2 (CALCD.)	79	RUBIDIUM TOTAL
10	ARSENIC DISSOLVED	45	GALLIUM TOTAL	80	SATURATION INDEX (CALCD.)
11	ARSENIC TOTAL	46	GALLIUM, DISSOLVED	81	SELENIUM DISSOLVED
12	BARIUM DISSOLVED	47	GAMMA-BENZENEHEXACHLORIDE	82	SELENIUM TOTAL
13	BARIUM TOTAL	48	HARDNESS NON-CARB.	83	SILVER DISSOLVED
14	BERYLLIUM DISSOLVED	49	HARDNESS TOTAL CACO3	84	SILVER TOTAL
15	BERYLLIUM TOTAL	50	IRON DISSOLVED	85	SIO2
16	BICARBONATE (CALCD.)	51	IRON TOTAL	86	SODIUM ADSORPTION RATIO
17	BISMUTH DISSOLVED	52	LANTHANUM TOTAL	87	SODIUM DISSOLVED/FILTERED
18	BISMUTH TOTAL	53	LANTHANUM DISSOLVED	88	SODIUM PERCENTAGE (CALCD.)
19	BORON DISSOLVED	54	LEAD DISSOLVED	89	SPECIFIC CONDUCTANCE
20	BORON TOTAL	55	LEAD TOTAL	90	SPECIFIC CONDUCTANCE
21	CADMIUM DISSOLVED	56	LITHIUM DISSOLVED	91	STABILITY INDEX (CALCD.)
22	CADMIUM TOTAL	57	LITHIUM TOTAL	92	STRONTIUM DISSOLVED
23	CALCIUM DISSOLVED/FILTERED	58	MAGNESIUM DISSOLVED/FILTERED	93	STRONTIUM TOTAL
24	CARBON DISSOLVED ORGANIC	59	MANGANESE TOTAL	94	SULPHATE DISSOLVED
25	CARBON PARTICULATE ORGANIC	60	MCPA	95	TEMPERATURE WATER

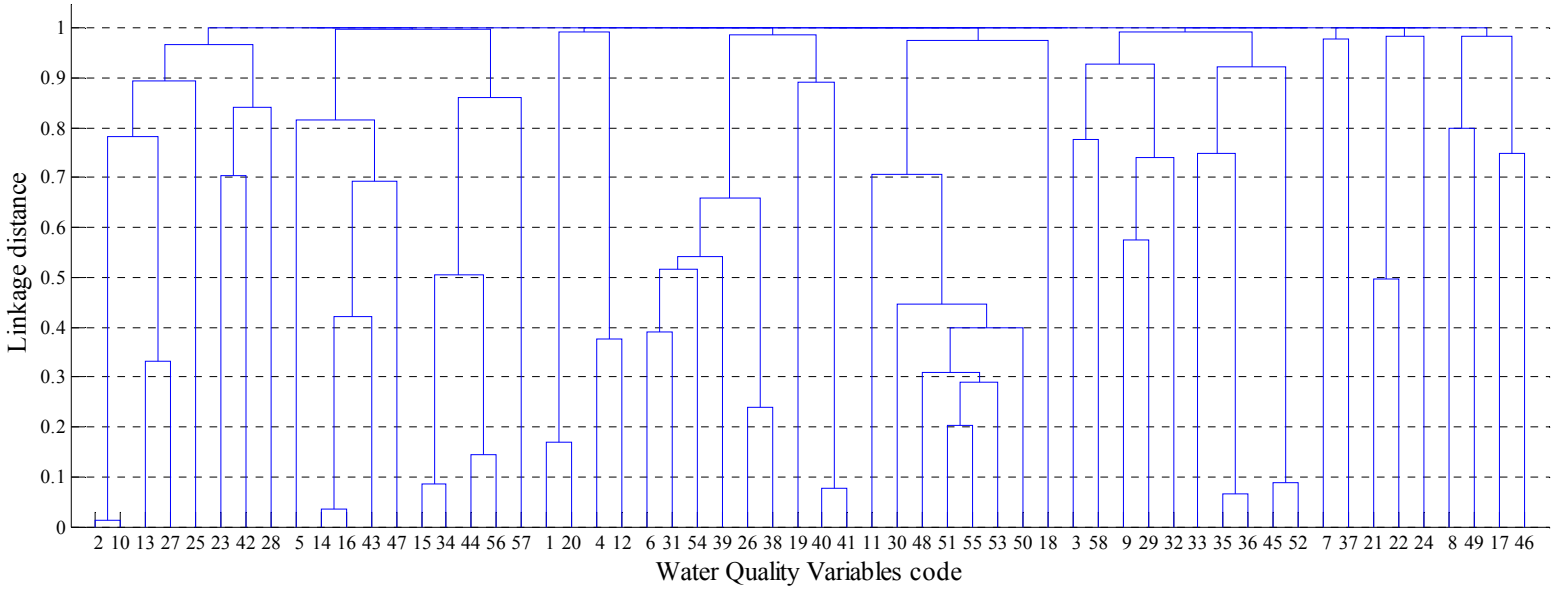
26	CARBON TOTAL ORGANIC	61	MOLYBDENUM DISSOLVED	96	THALLIUM DISSOLVED
27	CARBONATE (CALCD.)	62	MOLYBDENUM TOTAL	97	THALLIUM TOTAL
28	CHLORIDE DISSOLVED	63	NICKEL DISSOLVED	98	TOTAL DISSOLVED SOLIDS
29	CHROMIUM DISSOLVED	64	NICKEL TOTAL	99	TURBIDITY
30	CHROMIUM TOTAL	65	NITROGEN DISSOLVED NO3 & NO2	100	URANIUM DISSOLVED
31	CLOPYRALID	66	NITROGEN PARTICULATE	101	URANIUM TOTAL
32	COBALT DISSOLVED	67	NITROGEN TOTAL (CALCD.)	102	VANADIUM DISSOLVED
33	COBALT TOTAL	68	NITROGEN TOTAL DISSOLVED	103	VANADIUM TOTAL
34	COLIFORMS FECAL	69	OXYGEN DISSOLVED	104	ZINC DISSOLVED
35	COLOUR TRUE	70	pH	105	ZINC TOTAL

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9993	384	0.0294	7.670
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9993	384	0.0294	7.671
NITROGEN TOTAL (CALCD.)	NITROGEN TOTAL DISSOLVED	0.9559	361	0.0314	7.674
PHOSPHOROUS PARTICULATE	PHOSPHOROUS TOTAL	0.9408	361	0.0314	7.675
CARBON PARTICULATE ORGANIC	RESIDUE NONFILTRABLE	0.9455	360	0.0315	7.675
NITROGEN TOTAL DISSOLVED	NITROGEN TOTAL (CALCD.)	0.9559	361	0.0314	7.676
PHOSPHOROUS TOTAL	PHOSPHOROUS PARTICULATE	0.9408	361	0.0314	7.677
SODIUM DISSOLVED/FILTERED	CHLORIDE DISSOLVED	0.9944	342	0.0328	7.677
CALCIUM DISSOLVED/FILTERED	ALKALINITY TOTAL CACO3	0.9435	343	0.033	7.678
CHLORIDE DISSOLVED	SODIUM DISSOLVED/FILTERED	0.9944	342	0.0328	7.678
ALKALINITY TOTAL CACO3	CALCIUM DISSOLVED/FILTERED	0.9435	343	0.033	7.678
MAGNESIUM DISSOLVED/FILTERED	ALKALINITY TOTAL CACO3	0.9275	334	0.0339	7.680
SPECIFIC CONDUCTANCE	CHLORIDE DISSOLVED	0.9894	326	0.0343	7.680
SPECIFIC CONDUCTANCE	SODIUM DISSOLVED/FILTERED	0.9794	330	0.034	7.683
CARBON TOTAL ORGANIC	CARBON DISSOLVED ORGANIC	0.8478	317	0.036	7.684
HARDNESS TOTAL CACO3	ALKALINITY TOTAL CACO3	0.9671	305	0.0367	7.685
CARBON DISSOLVED ORGANIC	CARBON TOTAL ORGANIC	0.8478	317	0.036	7.687
BICARBONATE (CALCD.)	ALKALINITY TOTAL CACO3	0.9999	267	0.0412	7.693
TOTAL DISSOLVED SOLIDS	CHLORIDE DISSOLVED	0.9893	263	0.0419	7.695
SATURATION INDEX (CALCD.)	STABILITY INDEX (CALCD.)	-0.9774	218	0.0498	7.708
STABILITY INDEX (CALCD.)	SATURATION INDEX (CALCD.)	-0.9774	218	0.0498	7.708
VANADIUM TOTAL	TURBIDITY	0.8289	190	0.0585	7.723
PHOSPHOROUS DISSOLVED ORTHO	PHOSPHOROUS TOTAL DISSOLVED	0.9714	173	0.0614	7.726
TURBIDITY	VANADIUM TOTAL	0.8289	190	0.0585	7.742

Discontinued Variable	**Best-auxiliary**	***r***	n_1	***var(u)***	I_a
PHOSPHOROUS TOTAL DISSOLVED	PHOSPHOROUS DISSOLVED ORTHO	0.9714	173	0.0614	7.746
ALUMINUM TOTAL	TURBIDITY	0.8807	141	0.0758	7.747
LEAD TOTAL	CHROMIUM TOTAL	0.8303	123	0.0873	7.765
CHROMIUM TOTAL	LEAD TOTAL	0.8303	123	0.0873	7.777
BARIUM DISSOLVED	STRONTIUM DISSOLVED	0.9426	95	0.1043	7.779
STRONTIUM DISSOLVED	BARIUM DISSOLVED	0.9426	95	0.1043	7.779
STRONTIUM TOTAL	HARDNESS TOTAL CACO3	0.9448	95	0.1041	7.780
LITHIUM DISSOLVED	BORON DISSOLVED	0.9337	95	0.1048	7.780
MANGANESE TOTAL	BARIUM TOTAL	0.8901	96	0.1062	7.783
LITHIUM TOTAL	CHLORIDE DISSOLVED	0.8663	96	0.1075	7.785
SODIUM ADSORPTION RATIO	SODIUM PERCENTAGE (CALCD.)	0.9247	81	0.1205	7.798
BERYLLIUM TOTAL	COPPER TOTAL	0.9607	74	0.1265	7.801
BARIUM TOTAL	MANGANESE TOTAL	0.8901	96	0.1062	7.805
LANTHANUM TOTAL	BERYLLIUM TOTAL	0.9826	67	0.1341	7.807
GALLIUM TOTAL	ALUMINUM TOTAL	0.9799	67	0.1345	7.807
LANTHANUM DISSOLVED	ALUMINUM DISSOLVED	0.976	66	0.1366	7.810
BISMUTH TOTAL	VANADIUM TOTAL	0.9734	64	0.1402	7.813
BORON TOTAL	CHLORIDE DISSOLVED	0.936	68	0.1383	7.813
BERYLLIUM DISSOLVED	ALUMINUM DISSOLVED	0.9644	64	0.1415	7.814
URANIUM DISSOLVED	URANIUM TOTAL	0.9369	67	0.1399	7.814
URANIUM TOTAL	URANIUM DISSOLVED	0.9369	67	0.1399	7.814
ALUMINUM DISSOLVED	LANTHANUM DISSOLVED	0.976	66	0.1366	7.817
RUBIDIUM TOTAL	COBALT TOTAL	0.9159	67	0.1424	7.818
BORON DISSOLVED	LITHIUM DISSOLVED	0.9337	95	0.1048	7.818

Discontinued Variable	**Best-auxiliary**	***r***	n_1	***var(u)***	I_a
ANTIMONY TOTAL	ANTIMONY DISSOLVED	0.8933	66	0.147	7.823
ANTIMONY DISSOLVED	ANTIMONY TOTAL	0.8933	66	0.147	7.823
SODIUM PERCENTAGE (CALCD.)	SODIUM ADSORPTION RATIO	0.9247	81	0.1205	7.833
COPPER TOTAL	BERYLLIUM TOTAL	0.9607	74	0.1265	7.841
LEAD DISSOLVED	SILVER TOTAL	0.9099	58	0.1624	7.844
SILVER TOTAL	LEAD DISSOLVED	0.9099	58	0.1624	7.851
COBALT TOTAL	RUBIDIUM TOTAL	0.9159	67	0.1424	7.856
BISMUTH DISSOLVED	ALUMINUM DISSOLVED	0.9234	43	0.2191	7.884

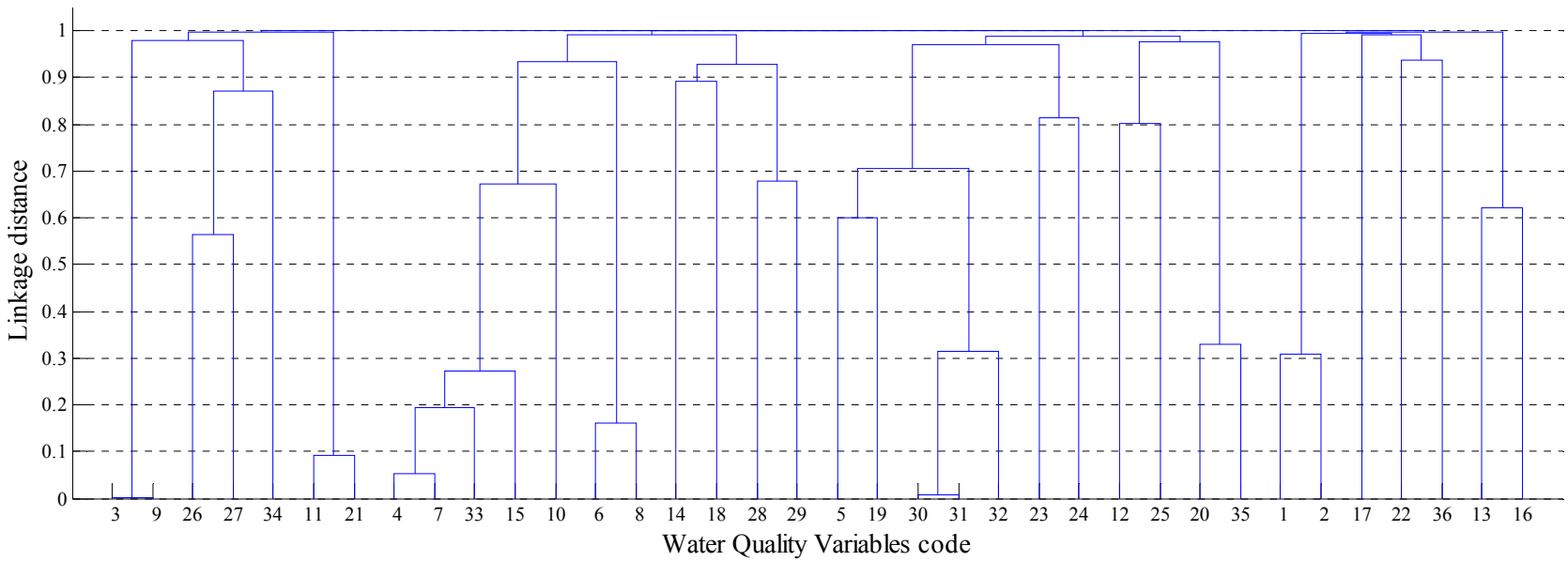
East Poplar River SA11AE0008 (SASK_8)



Code	Water quality variables	Code	Water quality variables	Code	Water quality variables
1	2,4-D	20	CHROMIUM TOTAL	39	pH field
2	ALKALINITY TOTAL CACO3	21	COLIFORMS FECAL	40	PHOSPHOROUS PARTICULATE
3	ALPHA-BENZENEHEXACHLORIDE	22	COLIFORMS TOTAL	41	PHOSPHOROUS TOTAL
4	ALUMINUM DISSOLVED	23	COLOUR TRUE	42	PHOSPHOROUS TOTAL DISSOLVED
5	ALUMINUM EXTRACTABLE	24	COPPER TOTAL	43	POTASSIUM DISSOLVED/FILTERED
6	AMMONIA DISSOLVED	25	FLUORIDE DISSOLVED	44	RESIDUE NONFILTRABLE
7	AMMONIA UN-IONIZED (CALCD.)	26	FREE CO2 (CALCD.)	45	SATURATION INDEX (CALCD.)
8	ARSENIC DISSOLVED	27	HARDNESS TOTAL CACO3	46	SELENIUM DISSOLVED
9	BARIUM TOTAL	28	IRON DISSOLVED	47	SIO2
10	BICARBONATE (CALCD.)	29	LEAD TOTAL	48	SODIUM DISSOLVED/FILTERED
11	BORON DISSOLVED	30	MAGNESIUM DISSOLVED/FILTERED	49	SODIUM PERCENTAGE (CALCD.)
12	CADMIUM TOTAL	31	MANGANESE DISSOLVED	50	SPECIFIC CONDUCTANCE
13	CALCIUM DISSOLVED/FILTERED	32	NICKEL TOTAL	51	SPECIFIC CONDUCTANCE
14	CARBON DISSOLVED ORGANIC	33	NITROGEN DISSOLVED NO3 & NO2	52	STABILITY INDEX (CALCD.)
15	CARBON PARTICULATE ORGANIC	34	NITROGEN PARTICULATE	53	SULPHATE DISSOLVED
16	CARBON TOTAL ORGANIC	35	NITROGEN TOTAL (CALCD.)	54	TEMPERATURE WATER
17	CARBONATE (CALCD.)	36	NITROGEN TOTAL DISSOLVED	55	TOTAL DISSOLVED SOLIDS
18	CHLORIDE DISSOLVED	37	OXYGEN DISSOLVED	56	TURBIDITY
19	CHLOROPHYLL A	38	pH	57	VANADIUM TOTAL
				58	ZINC TOTAL

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
SODIUM DISSOLVED/FILTERED	SULPHATE DISSOLVED	0.8333	255	0.0443	4.112
SULPHATE DISSOLVED	SODIUM DISSOLVED/FILTERED	0.8333	255	0.0443	4.112
SPECIFIC CONDUCTANCE	SULPHATE DISSOLVED	0.8421	251	0.0449	4.113
RESIDUE NONFILTRABLE	TURBIDITY	0.9254	243	0.0456	4.114
TURBIDITY	RESIDUE NONFILTRABLE	0.9254	243	0.0456	4.115
NITROGEN PARTICULATE	CARBON PARTICULATE ORGANIC	0.9568	213	0.0511	4.123
CARBON PARTICULATE ORGANIC	NITROGEN PARTICULATE	0.9568	213	0.0511	4.124
NITROGEN TOTAL (CALCD.)	NITROGEN TOTAL DISSOLVED	0.9672	197	0.0548	4.129
BICARBONATE (CALCD.)	ALKALINITY TOTAL CACO3	0.9941	190	0.0562	4.131
NITROGEN TOTAL DISSOLVED	NITROGEN TOTAL (CALCD.)	0.9672	197	0.0548	4.131
CARBON TOTAL ORGANIC	CARBON DISSOLVED ORGANIC	0.9822	188	0.0569	4.132
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED/FILTERED	0.8172	190	0.0586	4.135
CARBON DISSOLVED ORGANIC	CARBON TOTAL ORGANIC	0.9822	188	0.0569	4.136
PHOSPHOROUS PARTICULATE	PHOSPHOROUS TOTAL	0.9613	178	0.0601	4.136
TOTAL DISSOLVED SOLIDS	SODIUM DISSOLVED/FILTERED	0.8564	185	0.0596	4.137
ALKALINITY TOTAL CACO3	BICARBONATE (CALCD.)	0.9941	190	0.0562	4.138
CALCIUM DISSOLVED/FILTERED	HARDNESS TOTAL CACO3	0.8172	190	0.0586	4.144
PHOSPHOROUS TOTAL	PHOSPHOROUS PARTICULATE	0.9613	178	0.0601	4.146
SATURATION INDEX (CALCD.)	STABILITY INDEX (CALCD.)	-0.9547	140	0.0744	4.156
STABILITY INDEX (CALCD.)	SATURATION INDEX (CALCD.)	-0.9547	140	0.0744	4.157
FREE CO2 (CALCD.)	pH	-0.8715	144	0.0746	4.158
pH	FREE CO2 (CALCD.)	-0.8715	144	0.0746	4.174

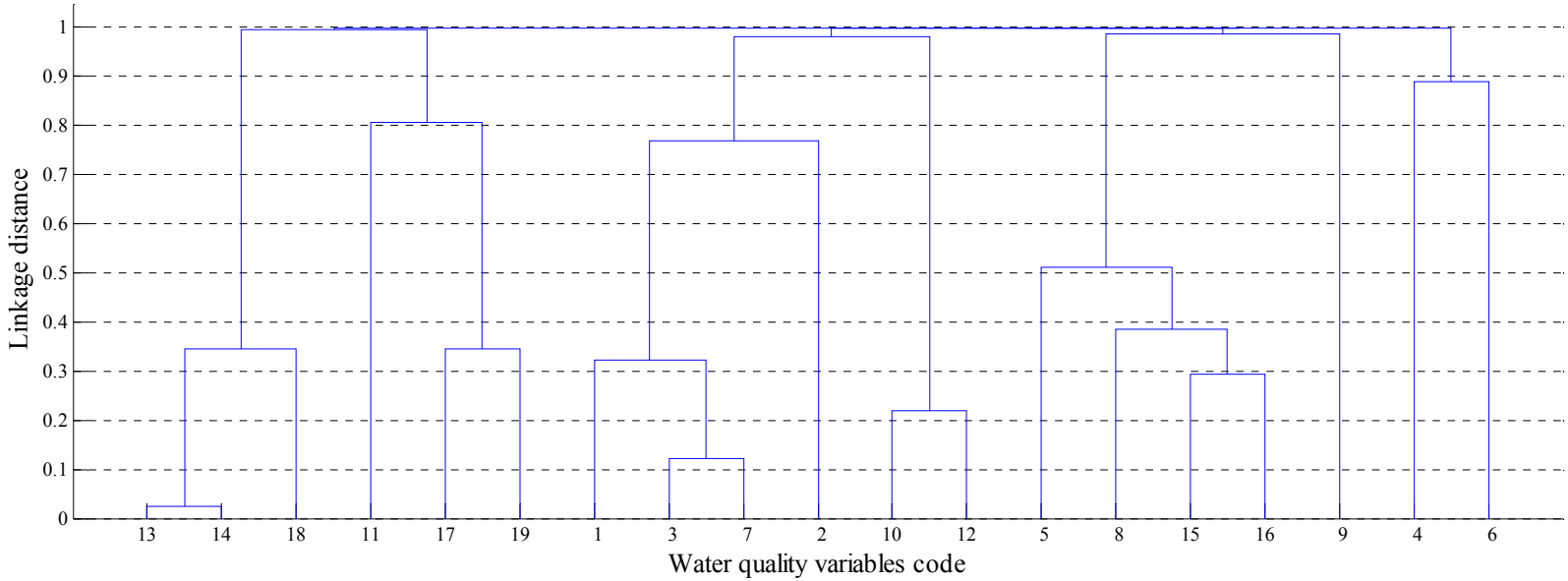
Sampling site: SK05HF0206 (SASK_9)



Code	Water Quality Variables	Code	Water Quality Variables	Code	Water Quality Variables
1	ALGAE PRESENCE AT SITE	13	COLIFORMS FECAL	25	OXYGEN BIOCHEMICAL DEMAND
2	ALGAE PRESENCE IN SAMPLE	14	COLIFORMS TOTAL	26	OXYGEN DISSOLVED (Field)
3	ALKALINITY PHENOLPHTHALEIN CACO3	15	CONDUCTANCE (FIELD)	27	OXYGEN DISSOLVED
4	ALKALINITY TOTAL CACO3	16	COPPER TOTAL	28	PHOSPHOROUS DISSOLVED ORTHO
5	ALUMINUM TOTAL	17	CYANIDE TOTAL	29	PHOSPHOROUS TOTAL
6	ARSENIC TOTAL	18	FECAL STREPTOCOCCI	30	RESIDUE FIXED NONFILTRABLE
7	BICARBONATE	19	IRON TOTAL	31	RESIDUE NONFILTRABLE
8	BORON TOTAL	20	MANGANESE TOTAL	32	RESIDUE VOLATILE NONFILTRABLE
9	CARBONATE	21	NICKEL TOTAL	33	SPECIFIC CONDUCTANCE
10	CHLORIDE DISSOLVED	22	NITROGEN DISSOLVED NO3 & NO2	34	TEMPERATURE WATER (FIELD)
11	CHLOROPHYLL A	23	NITROGEN TOTAL AMMONIA	35	TURBIDITY
12	CHROMIUM TOTAL	24	NITROGEN TOTAL KJELDAHL	36	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
ALKALINITY TOTAL CACO3	SPECIFIC CONDUCTANCE	0.8976	238	0.0468	2.910
SPECIFIC CONDUCTANCE	ALKALINITY TOTAL CACO3	0.8976	238	0.0468	2.910
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.996	226	0.048	2.911
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.996	226	0.048	2.913
RESIDUE VOLATILE NONFILTRABLE	RESIDUE NONFILTRABLE	0.8557	213	0.0523	2.919
CONDUCTANCE (FIELD)	SPECIFIC CONDUCTANCE	0.8768	207	0.0534	2.921
BICARBONATE	ALKALINITY TOTAL CACO3	0.9732	178	0.0599	2.930
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.9998	122	0.0822	2.959
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.9998	122	0.0822	2.964
ALGAE PRESENCE AT SITE	ALGAE PRESENCE IN SAMPLE	0.8322	83	0.1247	3.013
ALGAE PRESENCE IN SAMPLE	ALGAE PRESENCE AT SITE	0.8322	83	0.1247	3.022
BORON TOTAL	ARSENIC TOTAL	0.9157	38	0.3318	3.196
ARSENIC TOTAL	BORON TOTAL	0.9157	38	0.3318	3.230

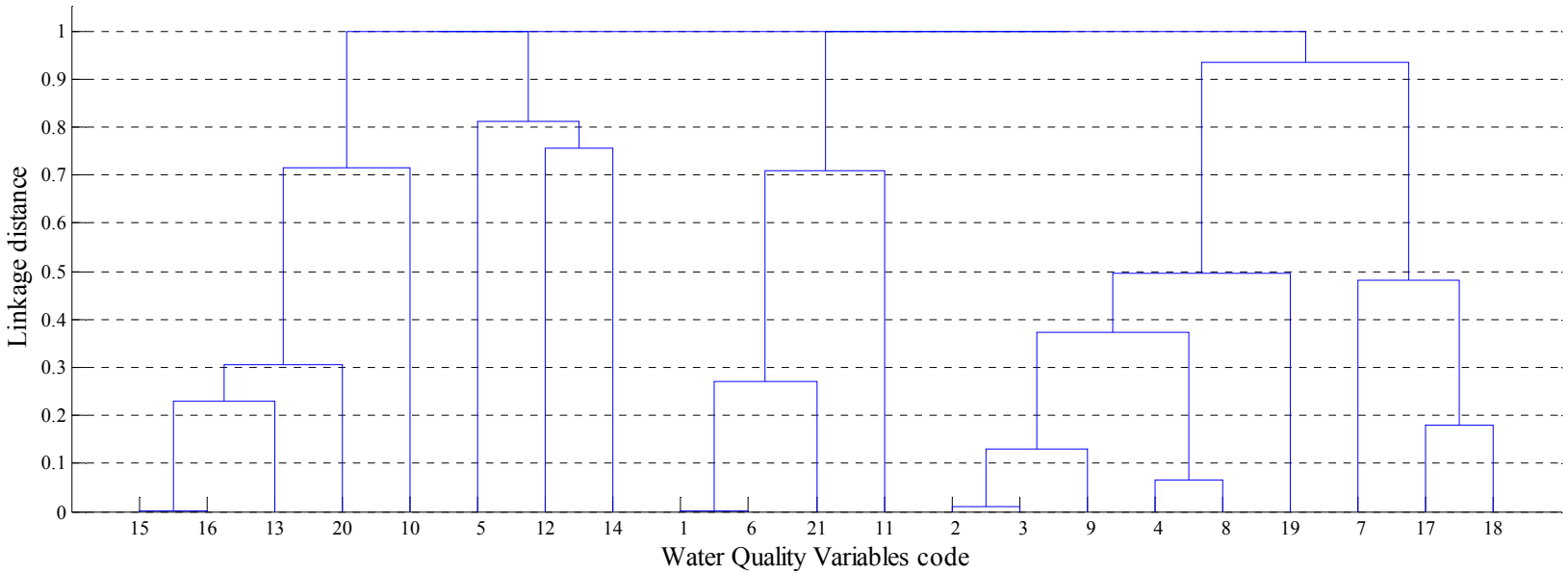
Sampling site: SK05HG0283 (SASK_10)



Code	Water quality variables
1	ALKALINITY TOTAL CACO3
2	BICARBONATE
3	CALCIUM DISSOLVED
4	CARBON DISSOLVED ORGANIC
5	CHLORIDE DISSOLVED
6	FECAL STREPTOCOCCI
7	HARDNESS TOTAL CACO3
8	MAGNESIUM DISSOLVED
9	NITROGEN DISSOLVED NITRATE
10	NITROGEN TOTAL KJELDAHL
11	OXYGEN DISSOLVED (Field)
12	PHOSPHOROUS TOTAL
13	RESIDUE FIXED NONFILTRABLE
14	RESIDUE NONFILTRABLE
15	SODIUM DISSOLVED
16	SULPHATE DISSOLVED
17	TEMPERATURE WATER
18	TURBIDITY
19	pH

Discontinued Variable	Best-auxiliary	r	n_1	$var(u)$	I_a
SULPHATE DISSOLVED	SODIUM DISSOLVED	0.8402	34	-0.0078	2.451
SODIUM DISSOLVED	SULPHATE DISSOLVED	0.8402	34	-0.0078	2.458
NITROGEN TOTAL KJELDAHL	PHOSPHOROUS TOTAL	0.8837	31	0.1664	2.854
PHOSPHOROUS TOTAL	NITROGEN TOTAL KJELDAHL	0.8837	31	0.1664	2.864
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.987	38	0.2156	2.923
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.987	38	0.2156	2.923
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.9377	38	0.2969	3.003
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED	0.9377	38	0.2969	3.003
ALKALINITY TOTAL CACO3	HARDNESS TOTAL CACO3	0.8358	38	0.4515	3.130

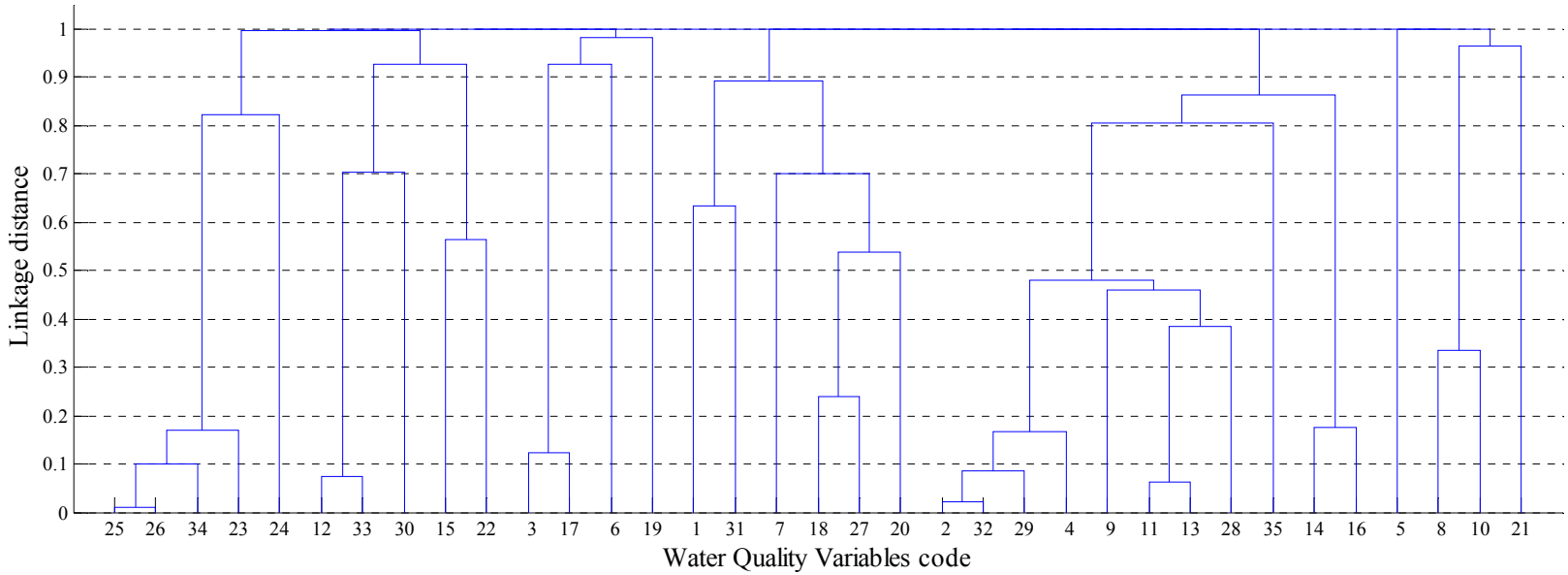
Sampling site: SK05FF0020 (SASK_11)



Code	Water quality variables
1	ALKALINITY PHENOLPHTHALEIN CACO3
2	ALKALINITY TOTAL CACO3
3	BICARBONATE
4	CALCIUM DISSOLVED
5	CARBON DISSOLVED ORGANIC
6	CARBONATE
7	CHLORIDE DISSOLVED
8	HARDNESS TOTAL CACO3
9	MAGNESIUM DISSOLVED
10	NITROGEN TOTAL KJELDAHL
11	OXYGEN DISSOLVED (Field)
12	OXYGEN TOTAL COD
13	PHOSPHOROUS TOTAL
14	POTASSIUM DISSOLVED
15	RESIDUE FIXED NONFILTRABLE
16	RESIDUE NONFILTRABLE
17	SODIUM DISSOLVED
18	SULPHATE DISSOLVED
19	TEMPERATURE WATER
20	TURBIDITY
21	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
TURBIDITY	RESIDUE NONFILTRABLE	0.834	34	-0.015	2.830
RESIDUE NONFILTRABLE	TURBIDITY	0.834	34	-0.015	2.830
PHOSPHOROUS TOTAL	TURBIDITY	0.869	34	0.028	3.000
RESIDUE FIXED NONFILTRABLE	TURBIDITY	0.839	33	0.075	3.101
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED	0.967	35	0.103	3.152
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.967	35	0.103	3.152
CARBONATE	pH	0.854	32	0.127	3.182
ALKALINITY PHENOLPHTHALEIN CACO3	pH	0.859	32	0.130	3.186
MAGNESIUM DISSOLVED	ALKALINITY TOTAL CACO3	0.944	34	0.128	3.187
pH	CARBONATE	0.854	32	0.127	3.188
ALKALINITY TOTAL CACO3	MAGNESIUM DISSOLVED	0.944	34	0.128	3.189
BICARBONATE	MAGNESIUM DISSOLVED	0.933	33	0.151	3.218
SULPHATE DISSOLVED	SODIUM DISSOLVED	0.906	30	0.190	3.257
SODIUM DISSOLVED	SULPHATE DISSOLVED	0.906	30	0.1904	3.268

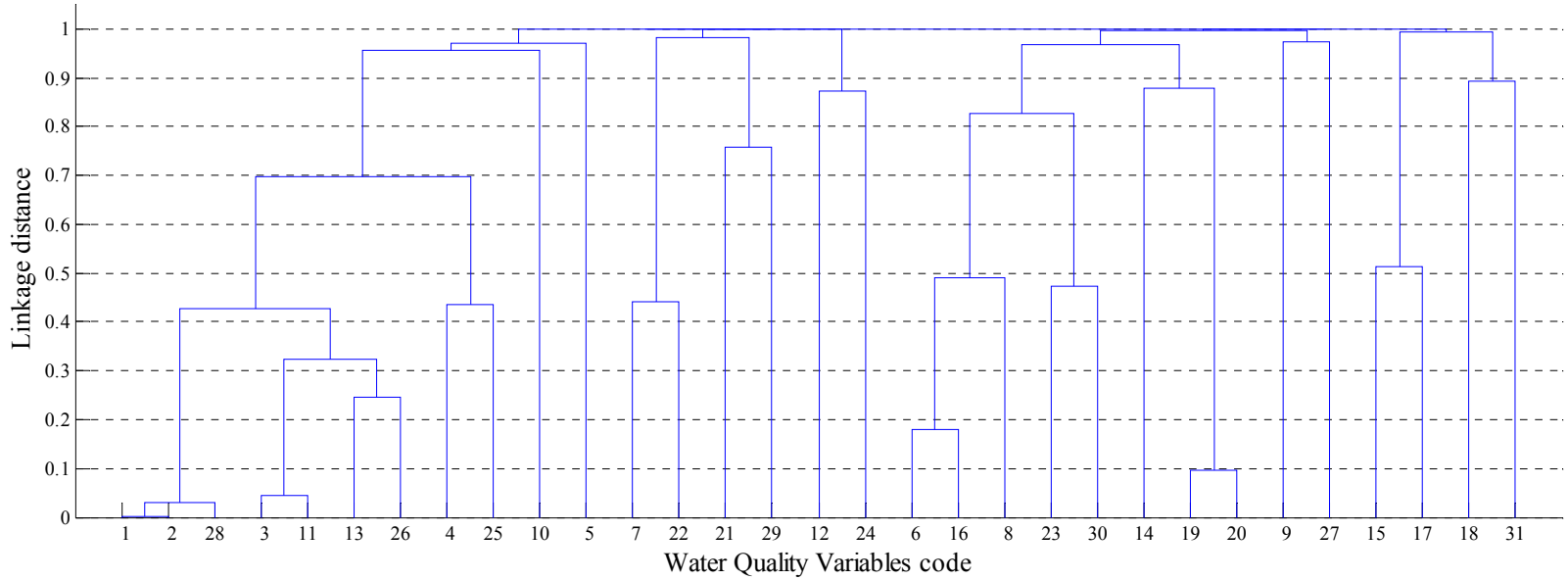
Sampling site: SK06AG0022 (SASK_12)



Code	Water quality variables	Code	Water quality variables
1	BARIUM TOTAL	19	OXYGEN DISSOLVED (FIELD METER)
2	BICARBONATE	20	OXYGEN TOTAL COD
3	BORON TOTAL	21	PH (FIELD)
4	CALCIUM DISSOLVED	22	PHOSPHOROUS DISSOLVED ORTHO
5	CARBON DISSOLVED ORGANIC	23	PHOSPHOROUS TOTAL
6	CHLORIDE DISSOLVED	24	POTASSIUM DISSOLVED
7	CHLOROPHYLL A	25	RESIDUE FIXED NONFILTRABLE
8	COLIFORMS TOTAL	26	RESIDUE NONFILTRABLE
9	CONDUCTANCE	27	RESIDUE VOLATILE NONFILTRABLE
10	FLUORIDE DISSOLVED	28	SODIUM DISSOLVED
11	HARDNESS TOTAL CACO3	29	SPECIFIC CONDUCTANCE
12	IRON TOTAL	30	SULPHATE DISSOLVED
13	MAGNESIUM DISSOLVED	31	TEMPERATURE WATER
14	MANGANESE TOTAL	32	TOTAL DISSOLVED SOLIDS
15	NITROGEN DISSOLVED NO3 & NO2	33	TURBIDITY (FIELD)
16	NITROGEN TOTAL AMMONIA	34	TURBIDITY
17	NITROGEN TOTAL KJELDAHL	35	pH
18	OXYGEN BIOCHEMICAL DEMAND		

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
PHOSPHOROUS TOTAL	TURBIDITY	0.9248	35	-0.0187	3.654
TURBIDITY	PHOSPHOROUS TOTAL	0.9248	35	-0.0187	3.681
SPECIFIC CONDUCTANCE	CALCIUM DISSOLVED	0.9127	99	0.1023	4.008
CALCIUM DISSOLVED	SPECIFIC CONDUCTANCE	0.9127	99	0.1023	4.008
HARDNESS TOTAL CACO3	MAGNESIUM DISSOLVED	0.9684	87	0.1104	4.015
MAGNESIUM DISSOLVED	HARDNESS TOTAL CACO3	0.9684	87	0.1104	4.021
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9954	74	0.1229	4.026
BICARBONATE	CALCIUM DISSOLVED	0.9681	76	0.1231	4.028
RESIDUE NONFILTRABLE	TURBIDITY	0.9482	81	0.1186	4.032
TOTAL DISSOLVED SOLIDS	SPECIFIC CONDUCTANCE	0.9779	49	0.1711	4.068

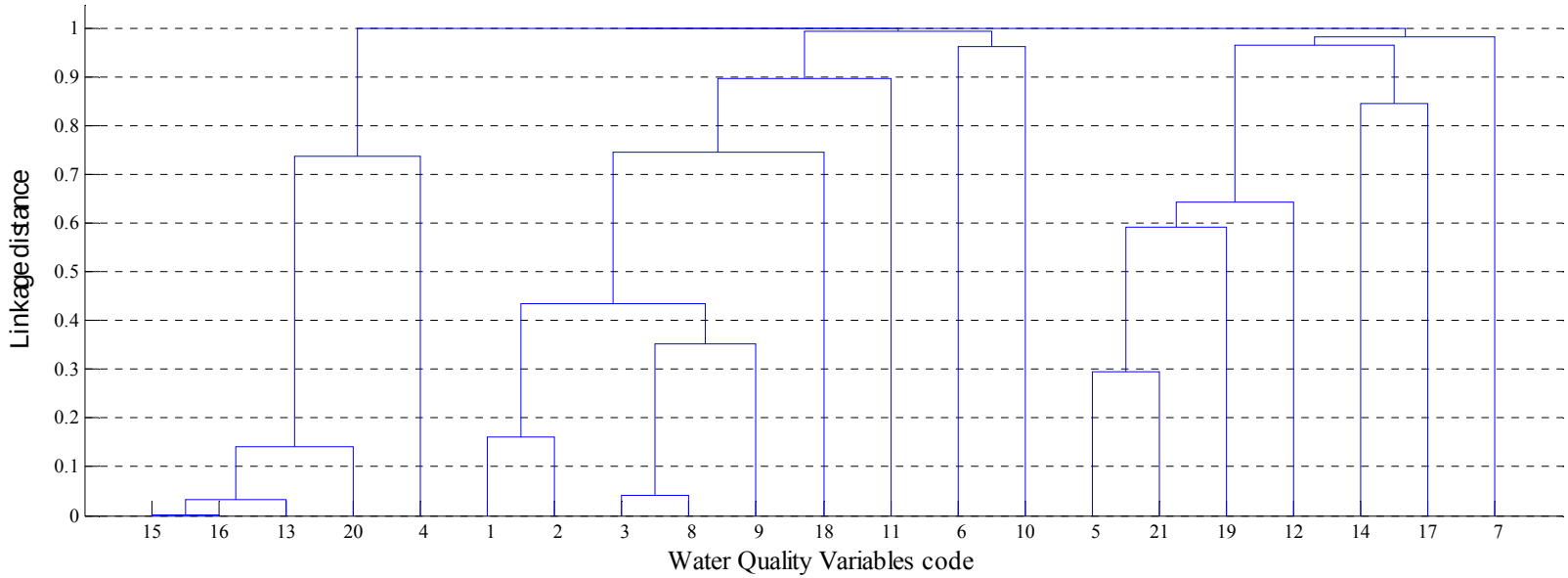
Sampling site: SK06CD0027 (SASK_13)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY TOTAL CACO3	17	NITROGEN TOTAL
2	BICARBONATE	18	PH (FIELD)
3	CALCIUM DISSOLVED	19	PHOSPHOROUS PARTICULATE
4	CARBON DISSOLVED INORGANIC	20	PHOSPHOROUS TOTAL
5	CARBON DISSOLVED ORGANIC	21	PHOSPHOROUS TOTAL DISSOLVED
6	CARBON PARTICULATE ORGANIC	22	POTASSIUM DISSOLVED
7	CHLORIDE DISSOLVED	23	RESIDUE NONFILTRABLE
8	CHLOROPHYLL A	24	SILICA REACTIVE
9	CONDUCTANCE (FIELD)	25	SODIUM DISSOLVED
10	FLUORIDE DISSOLVED	26	SPECIFIC CONDUCTANCE
11	HARDNESS TOTAL CACO3	27	SULPHATE DISSOLVED
12	IRON EXTRACTABLE	28	SUM MAJOR IONS
13	MAGNESIUM DISSOLVED	29	TEMPERATURE WATER
14	MANGANESE EXTRACTABLE	30	TURBIDITY
15	NITROGEN DISSOLVED	31	pH
16	NITROGEN PARTICULATE		

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.977	83	0.114	3.634
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED	0.977	83	0.114	3.634
MAGNESIUM DISSOLVED	HARDNESS TOTAL CACO3	0.953	83	0.116	3.637
SPECIFIC CONDUCTANCE	HARDNESS TOTAL CACO3	0.870	83	0.122	3.646
BICARBONATE	ALKALINITY TOTAL CACO3	0.999	61	0.141	3.657
NITROGEN PARTICULATE	CARBON PARTICULATE ORGANIC	0.905	31	0.175	3.658
CARBON PARTICULATE ORGANIC	NITROGEN PARTICULATE	0.905	31	0.175	3.672
ALKALINITY TOTAL CACO3	BICARBONATE	0.999	61	0.141	3.672
SUM MAJOR IONS	ALKALINITY TOTAL CACO3	0.985	38	0.220	3.722
PHOSPHOROUS PARTICULATE	PHOSPHOROUS TOTAL	0.950	39	0.248	3.753
PHOSPHOROUS TOTAL	PHOSPHOROUS PARTICULATE	0.950	39	0.248	3.794

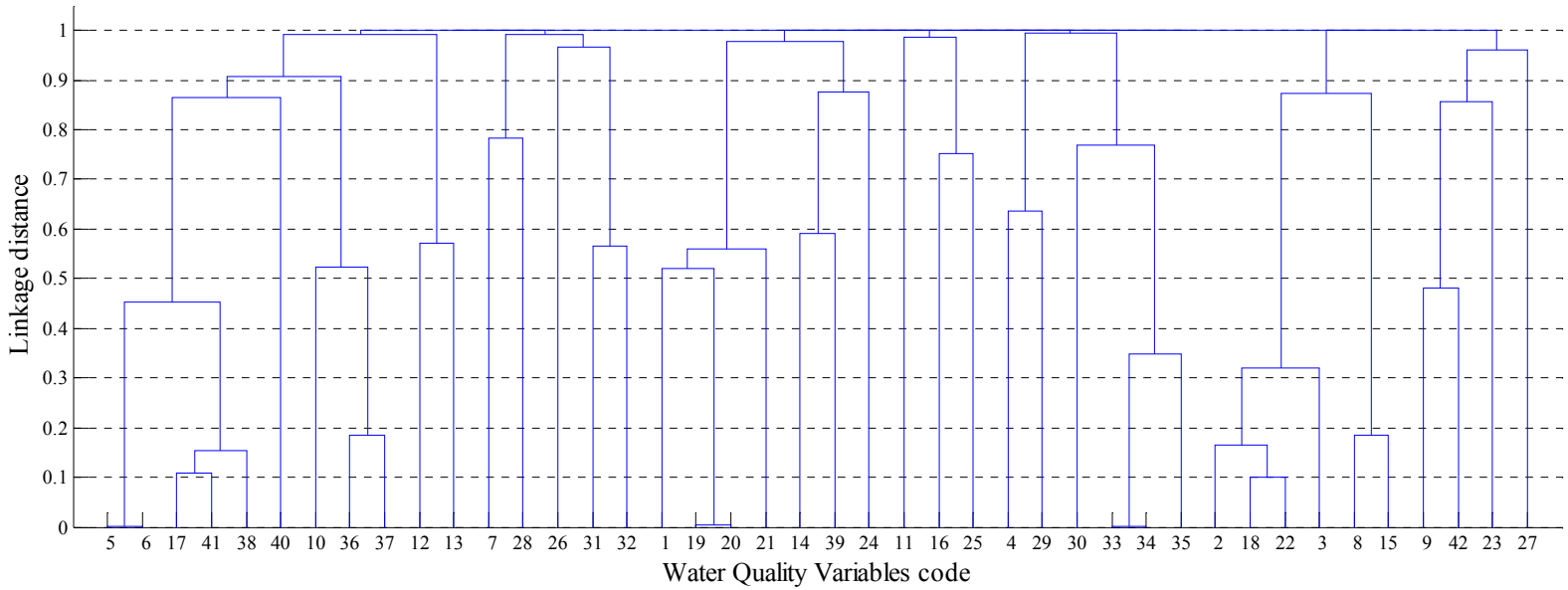
Sampling site: SK05GD0076 (SASK_14)



Code	Water quality variables
1	ALKALINITY TOTAL CACO3
2	BICARBONATE
3	CALCIUM DISSOLVED
4	CARBON DISSOLVED ORGANIC
5	CARBONATE
6	CHLORIDE DISSOLVED
7	CONDUCTANCE
8	HARDNESS TOTAL CaCO3
9	MAGNESIUM DISSOLVED
10	NITROGEN TOTAL KJELDAHL
11	OXYGEN DISSOLVED (Field)
12	pH (Field)
13	PHOSPHOROUS TOTAL
14	POTASSIUM DISSOLVED
15	RESIDUE FIXED NONFILTRABLE
16	RESIDUE NONFILTRABLE
17	SODIUM DISSOLVED
18	SULPHATE DISSOLVED
19	T MPERATUR WATER
20	TURBIDITY
21	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
TURBIDITY	RESIDUE NONFILTRABLE	0.9271	33	0.146	3.197
RESIDUE NONFILTRABLE	TURBIDITY	0.9271	33	0.146	3.205
RESIDUE FIXED NONFILTRABLE	TURBIDITY	0.9342	33	0.152	3.213
CARBONATE	pH	0.8391	30	0.1696	3.223
pH	CARBONATE	0.8391	30	0.1696	3.233
PHOSPHOROUS TOTAL	TURBIDITY	0.942	32	0.1781	3.243
HARDNESS TOTAL CaCO3	CALCIUM DISSOLVED	0.9794	33	0.1918	3.253
CALCIUM DISSOLVED	HARDNESS TOTAL CaCO3	0.9794	33	0.1918	3.261
BICARBONATE	ALKALINITY TOTAL CACO3	0.9153	37	0.4659	3.506
ALKALINITY TOTAL CACO3	BICARBONATE	0.9153	37	0.4659	3.506

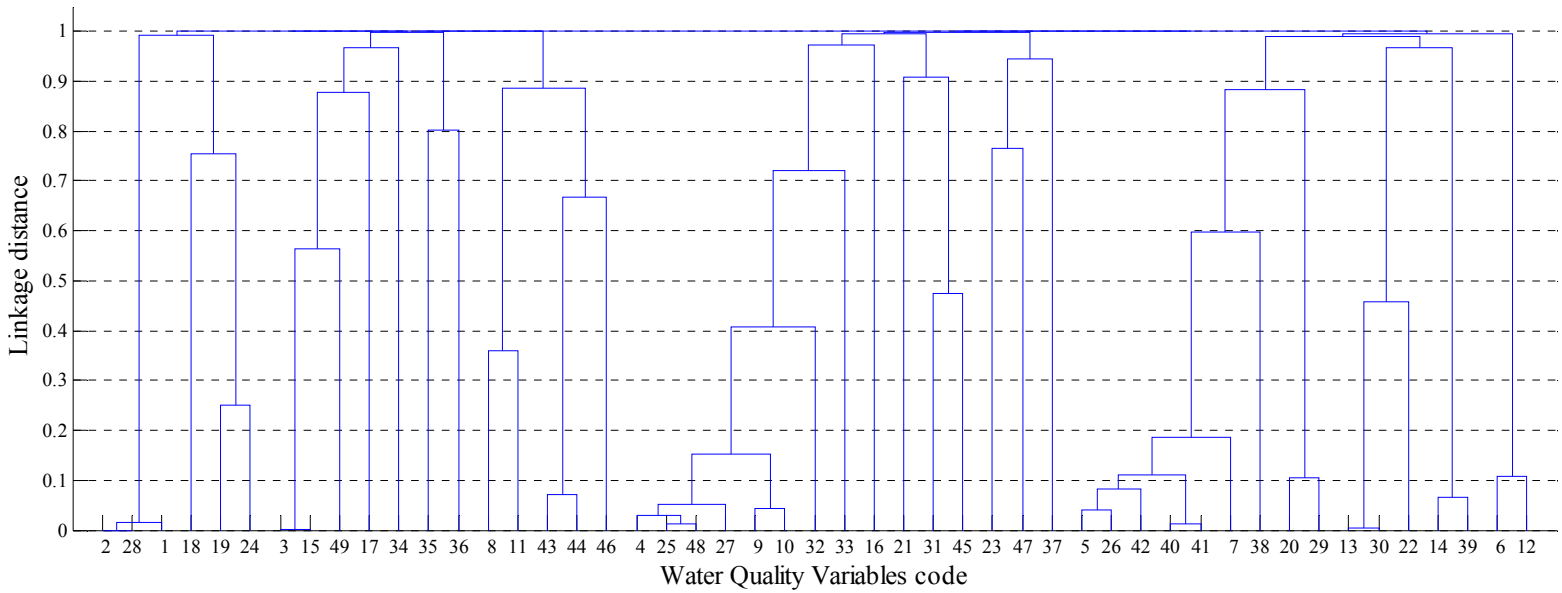
Sampling site: SK05GG0102 (SASK_15)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY TOTAL CACO3	22	MANGANESE TOTAL
2	ALUMINUM TOTAL	23	NITROGEN DISSOLVED NO3 & NO2
3	BARIUM TOTAL	24	NITROGEN TOTAL AMMONIA
4	BICARBONATE	25	NITROGEN TOTAL KJELDAHL
5	CALCIUM DISSOLVED	26	OXYGEN BIOCHEMICAL DEMAND
6	CALCIUM HARDNESS	27	OXYGEN DISSOLVED
7	CALCIUM TOTAL	28	OXYGEN TOTAL COD
8	CARBON TOTAL ORGANIC	29	PHOSPHOROUS DISSOLVED ORTHO
9	CARBONATE	30	PHOSPHORUS TOTAL
10	CHLORIDE DISSOLVED	31	POTASSIUM DISSOLVED
11	CHLOROPHYLL A	32	POTASSIUM TOTAL
12	COLIFORMS FECAL	33	RESIDUE FIXED NONFILTRABLE
13	COLIFORMS TOTAL	34	RESIDUE NONFILTRABLE
14	CONDUCTANCE (FIELD)	35	RESIDUE VOLATILE
15	COPPER TOTAL	36	SODIUM DISSOLVED
16	FECAL STREPTOCOCCI	37	SODIUM TOTAL
17	HARDNESS TOTAL CACO3	38	SPECIFIC CONDUCTANCE
18	IRON TOTAL	39	SULPHATE
19	MAGNESIUM DISSOLVED	40	TEMPERATURE WATER
20	MAGNESIUM HARDNESS	41	TOTAL DISSOLVED SOLIDS (CALCD.)
21	MAGNESIUM TOTAL	42	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
BARIUM TOTAL	IRON TOTAL	0.8715	35	-0.1655	3.674
ALUMINUM TOTAL	IRON TOTAL	0.9338	35	0.0071	3.757
IRON TOTAL	ALUMINUM TOTAL	0.9338	35	0.0071	3.759
MANGANESE TOTAL	IRON TOTAL	0.9492	35	0.0513	3.903
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9991	178	0.0594	3.993
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9991	178	0.0594	3.994
TOTAL DISSOLVED SOLIDS	HARDNESS TOTAL CACO3	0.9438	73	0.1296	4.075
HARDNESS TOTAL CACO3	SPECIFIC CONDUCTANCE	0.9195	80	0.1222	4.080
SPECIFIC CONDUCTANCE	HARDNESS TOTAL CACO3	0.9195	80	0.1222	4.096
CALCIUM HARDNESS	CALCIUM DISSOLVED	0.9996	47	0.1692	4.111
SODIUM TOTAL	SODIUM DISSOLVED	0.9033	29	0.2018	4.115
CALCIUM DISSOLVED	CALCIUM HARDNESS	0.9996	47	0.1692	4.138
MAGNESIUM HARDNESS	MAGNESIUM DISSOLVED	0.9982	24	0.25	4.164
SODIUM DISSOLVED	SODIUM TOTAL	0.9033	29	0.2018	4.198
MAGNESIUM DISSOLVED	MAGNESIUM HARDNESS	0.9982	24	0.25	4.227
COPPER TOTAL	CARBON TOTAL ORGANIC	-0.903	5	0.6385	4.460
CARBON TOTAL ORGANIC	COPPER TOTAL	-0.903	5	0.6385	4.516

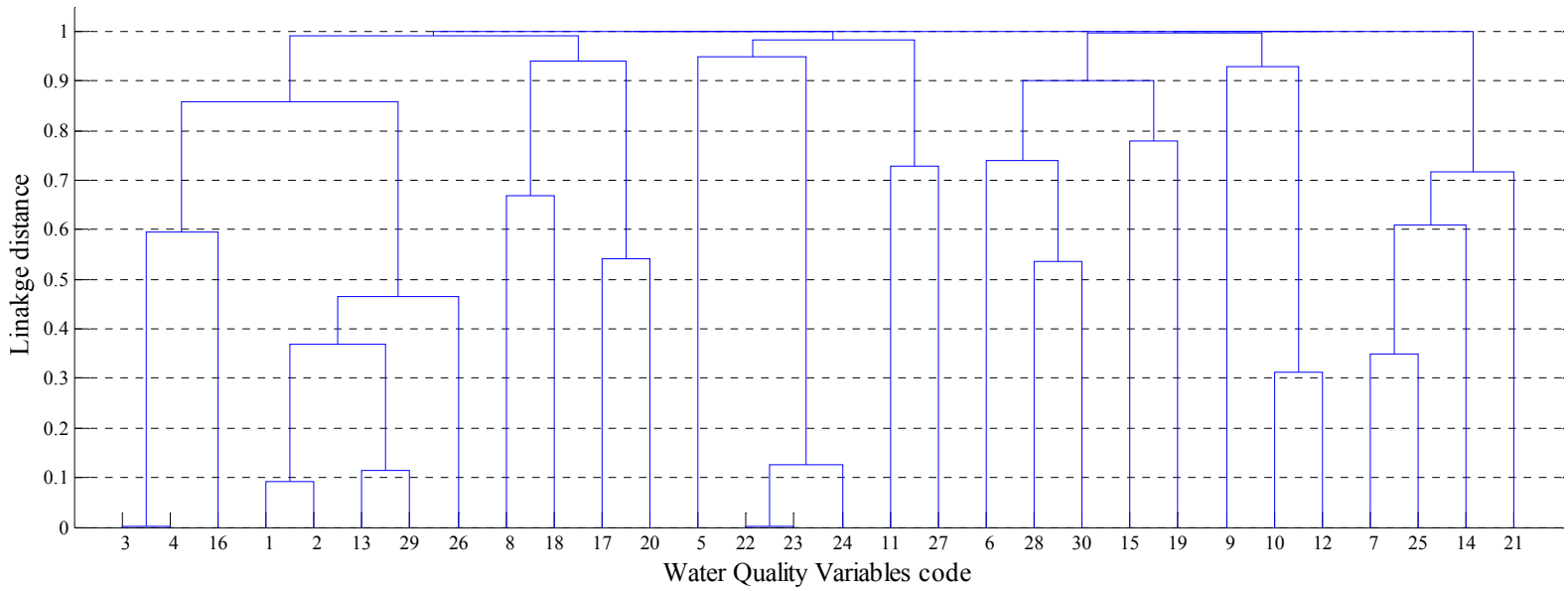
Sampling site: SK05GG0022 (SASK_16)



Code	Water quality variables	Code	Water quality variables
1	ALGAE PRESENCE AT SITE	25	HARDNESS TOTAL CACO3
2	ALGAE PRESENCE IN SAMPLE	26	IRON TOTAL
3	ALKALINITY PHENOLPHTHALEIN CACO3	27	MAGNESIUM DISSOLVED
4	ALKALINITY TOTAL CACO3	28	MAGNESIUM TOTAL
5	ALUMINUM TOTAL	29	MANGANESE TOTAL
6	ARSENIC TOTAL	30	NICKEL TOTAL
7	BARIUM TOTAL	31	NITROGEN DISSOLVED NO3 & NO2
8	BICARBONATE	32	NITROGEN TOTAL AMMONIA
9	CALCIUM DISSOLVED	33	NITROGEN TOTAL KJELDAHL
10	CALCIUM HARDNESS	34	OXYGEN BIOCHEMICAL DEMAND
11	CALCIUM TOTAL	35	OXYGEN DISSOLVED (FIELD METER)
12	CARBON TOTAL	36	OXYGEN DISSOLVED
13	CARBON TOTAL INORGANIC	37	PHOSPHOROUS DISSOLVED ORTHO
14	CARBON TOTAL ORGANIC	38	PHOSPHOROUS TOTAL
15	CARBONATE	39	POTASSIUM DISSOLVED
16	CHLORIDE DISSOLVED	40	RESIDUE FIXED NONFILTRABLE (FSS)
17	CHLOROPHYLL A	41	RESIDUE NONFILTRABLE (TSS)
18	COLIFORMS FECAL	42	RESIDUE VOLATILE NONFILTRABLE
19	COLIFORMS TOTAL	43	SODIUM DISSOLVED
20	COLOUR APPARENT	44	SODIUM TOTAL
21	CONDUCTANCE (FIELD)	45	SPECIFIC CONDUCTANCE
22	COPPER TOTAL	46	SULPHATE DISSOLVED
23	FECAL STREPTOCOCCI	47	TEMPERATURE WATER
24	FLUORIDE DISSOLVED	48	TOTAL DISSOLVED SOLIDS
		49	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
RESIDUE FIXED NONFILTRABLE (FSS)	RESIDUE NONFILTRABLE (TSS)	0.9932	224	0.0485	4.435
RESIDUE NONFILTRABLE (TSS)	RESIDUE FIXED NONFILTRABLE (FSS)	0.9932	224	0.0485	4.436
RESIDUE VOLATILE NONFILTRABLE	RESIDUE NONFILTRABLE (TSS)	0.9606	199	0.0543	4.445
HARDNESS TOTAL CACO3	ALKALINITY TOTAL CACO3	0.9849	146	0.071	4.468
MAGNESIUM DISSOLVED	ALKALINITY TOTAL CACO3	0.9736	141	0.0734	4.472
CALCIUM DISSOLVED	ALKALINITY TOTAL CACO3	0.9588	141	0.0738	4.472
ALKALINITY TOTAL CACO3	HARDNESS TOTAL CACO3	0.9849	146	0.071	4.482
TOTAL DISSOLVED SOLIDS	ALKALINITY TOTAL CACO3	0.9938	115	0.0866	4.488
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.9988	80	0.1155	4.519
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.9988	80	0.1155	4.526
CALCIUM HARDNESS	ALKALINITY TOTAL CACO3	0.9785	74	0.1247	4.528
ALGAE PRESENCE AT SITE	ALGAE PRESENCE IN SAMPLE	0.9919	58	0.1478	4.547
ALGAE PRESENCE IN SAMPLE	ALGAE PRESENCE AT SITE	0.9919	58	0.1478	4.563
ALUMINUM TOTAL	IRON TOTAL	0.9802	42	0.1941	4.584
IRON TOTAL	ALUMINUM TOTAL	0.9802	42	0.1941	4.585
SODIUM TOTAL	SODIUM DISSOLVED	0.964	27	0.2304	4.609
BARIUM TOTAL	IRON TOTAL	0.9341	42	0.2215	4.614
SODIUM DISSOLVED	SODIUM TOTAL	0.964	27	0.2304	4.687

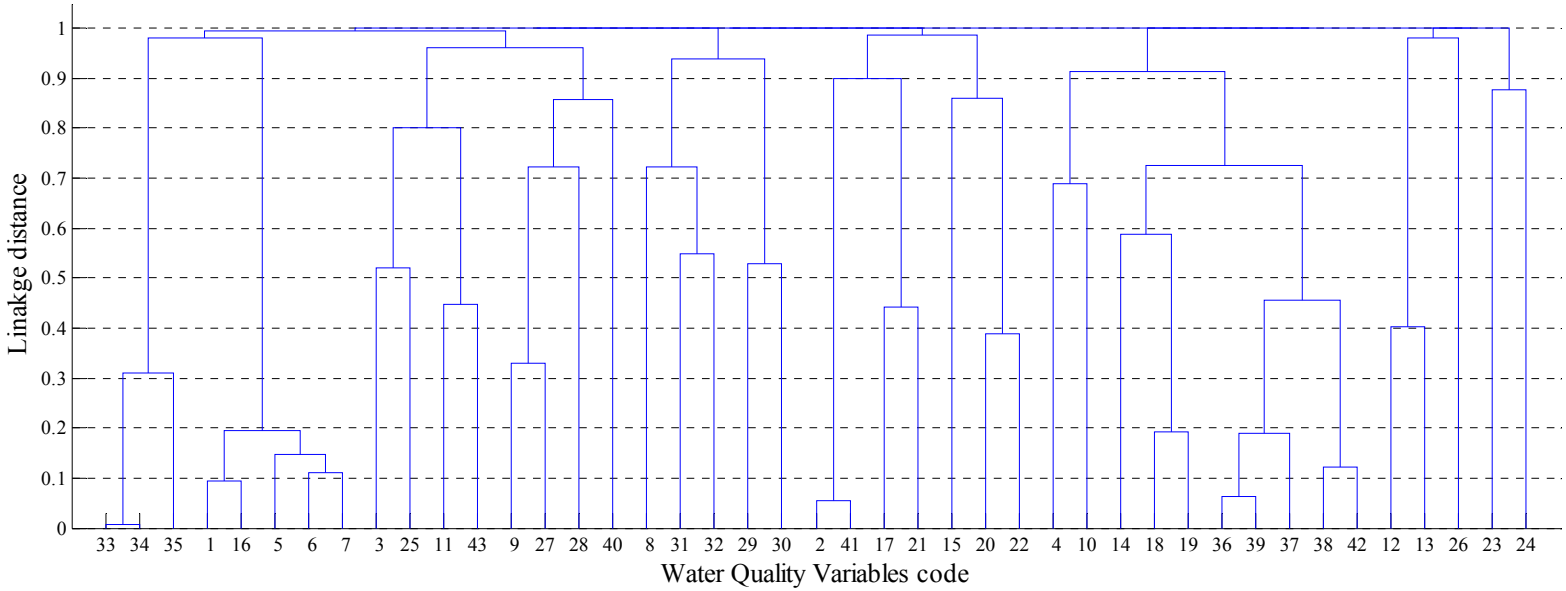
Sampling site: SK05EG0090 (SASK_17)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY TOTAL CACO3	16	NITROGEN TOTAL AMMONIA
2	BICARBONATE	17	NITROGEN TOTAL KJELDAHL
3	CALCIUM DISSOLVED	18	OXYGEN BIOCHEMICAL DEMAND
4	CALCIUM HARDNESS	19	PHOSPHOROUS DISSOLVED ORTHO
5	CARBON DISSOLVED ORGANIC	20	PHOSPHOROUS TOTAL
6	CARBONATE	21	POTASSIUM DISSOLVED
7	CHLORIDE DISSOLVED	22	RESIDUE FIXED NONFILTRABLE (FSS)
8	CHLOROPHYLL A	23	RESIDUE NONFILTRABLE (TSS)
9	COLIFORMS FECAL	24	RESIDUE VOLATILE NONFILTRABLE
10	COLIFORMS TOTAL	25	SODIUM DISSOLVED
11	CONDUCTANCE (FIELD)	26	SPECIFIC CONDUCTANCE
12	FECAL STREPTOCOCCI	27	SULPHATE
13	HARDNESS TOTAL CACO3	28	TEMPERATURE WATER
14	MAGNESIUM DISSOLVED	29	TOTAL DISSOLVED SOLIDS
15	NITROGEN DISSOLVED NO3 & NO2	30	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
RESIDUE FIXED NONFILTRABLE (FSS)	RESIDUE NONFILTRABLE (TSS)	0.9992	116	0.0857	3.022
RESIDUE NONFILTRABLE (TSS)	RESIDUE FIXED NONFILTRABLE (FSS)	0.9992	116	0.0857	3.023
RESIDUE VOLATILE NONFILTRABLE	RESIDUE NONFILTRABLE (TSS)	0.9439	97	0.1024	3.042
BICARBONATE	ALKALINITY TOTAL CACO3	0.9526	85	0.1137	3.054
TOTAL DISSOLVED SOLIDS	HARDNESS TOTAL CACO3	0.9411	76	0.1256	3.066
ALKALINITY TOTAL CACO3	BICARBONATE	0.9526	85	0.1137	3.067
HARDNESS TOTAL CACO3	TOTAL DISSOLVED SOLIDS	0.9411	76	0.1256	3.075
CALCIUM HARDNESS	CALCIUM DISSOLVED	0.9992	46	0.1717	3.099
CALCIUM DISSOLVED	CALCIUM HARDNESS	0.9992	46	0.1717	3.136
FECAL STREPTOCOCCI	COLIFORMS TOTAL	0.8288	22	0.2736	3.205
COLIFORMS TOTAL	FECAL STREPTOCOCCI	0.8288	22	0.2736	3.241

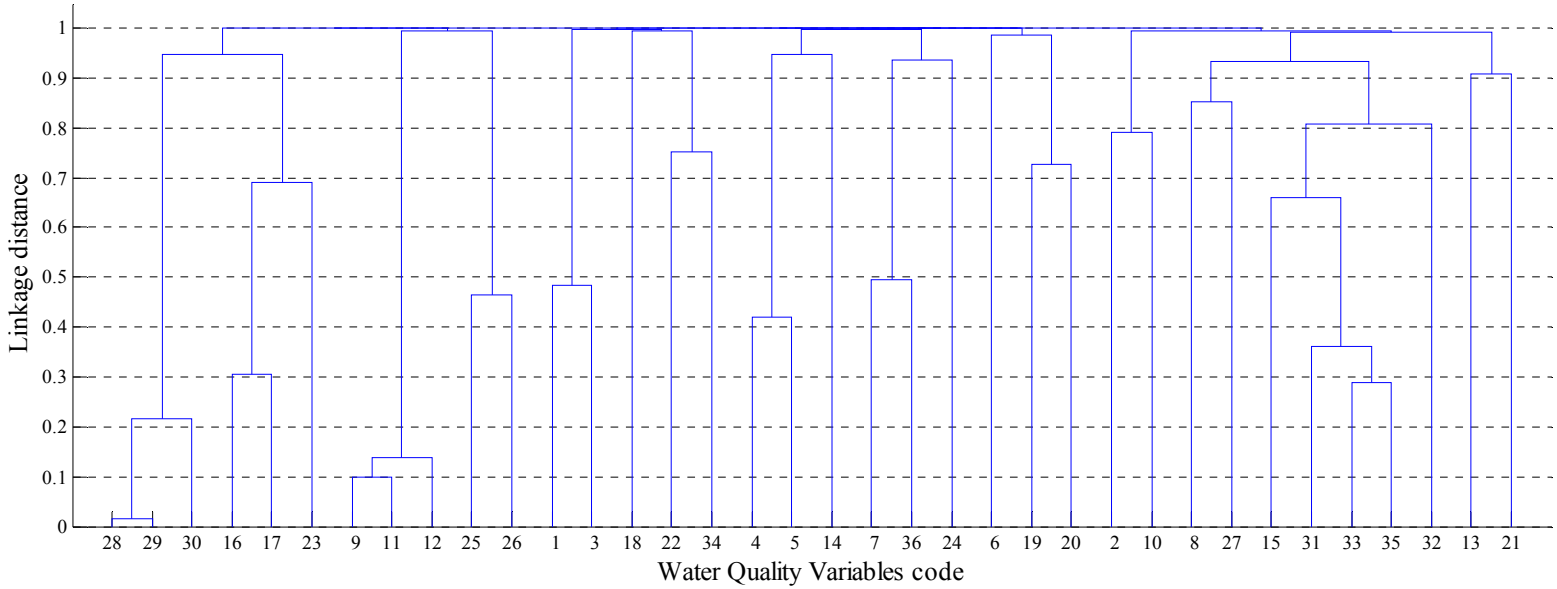
Sampling site: SK05JG0126 (SASK_18)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY TOTAL CACO3	23	NITROGEN TOTAL AMMONIA
2	ALUMINUM TOTAL	24	NITROGEN TOTAL KJELDAHL
3	ARSENIC TOTAL	25	OXYGEN BIOCHEMICAL DEMAND
4	BARIUM TOTAL -	26	OXYGEN DISSOLVED (FIELD METER)
5	BICARBONATE	27	pH
6	CALCIUM DISSOLVED	28	PH (FIELD)
7	CALCIUM TOTAL	29	PHOSPHOROUS DISSOLVED ORTHO
8	CARBON DISSOLVED ORGANIC	30	PHOSPHOROUS TOTAL
9	CARBONATE	31	POTASSIUM DISSOLVED
10	CHLORIDE DISSOLVED	32	POTASSIUM TOTAL
11	CHLOROPHYLL A	33	RESIDUE FIXED NONFILTRABLE
12	COLIFORMS FECAL	34	RESIDUE NONFILTRABLE
13	COLIFORMS TOTAL	35	RESIDUE VOLATILE NONFILTRABLE
14	CONDUCTANCE	36	SODIUM DISSOLVED
15	FECAL STREPTOCOCCI	37	SODIUM TOTAL
16	HARDNESS TOTAL CACO3	38	SPECIFIC CONDUCTANCE
17	IRON TOTAL	39	SULPHATE
18	MAGNESIUM DISSOLVED	40	TEMPERATURE WATER
19	MAGNESIUM TOTAL	41	TITANIUM TOTAL
20	MANGANESE TOTAL	42	TOTAL DISSOLVED SOLIDS
21	NICKEL TOTAL	43	TURBIDITY
22	NITROGEN DISSOLVED NO3 & NO2		

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9966	228	0.0477	3.805
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9966	228	0.0477	3.805
RESIDUE VOLATILE NONFILTRABLE	RESIDUE NONFILTRABLE	0.8723	229	0.0487	3.807
BICARBONATE	ALKALINITY TOTAL CACO3	0.9363	154	0.0688	3.837
HARDNESS TOTAL CACO3	ALKALINITY TOTAL CACO3	0.9521	138	0.0754	3.846
TITANIUM TOTAL	ALUMINUM TOTAL	0.9715	35	0.1173	3.847
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.9349	137	0.0764	3.847
MAGNESIUM TOTAL	MAGNESIUM DISSOLVED	0.8986	33	0.1221	3.848
ALKALINITY TOTAL CACO3	BICARBONATE	0.9363	154	0.0688	3.849
ALUMINUM TOTAL	TITANIUM TOTAL	0.9715	35	0.1173	3.851
SULPHATE	SODIUM DISSOLVED	0.9686	115	0.0876	3.861
TOTAL DISSOLVED SOLIDS	SPECIFIC CONDUCTANCE	0.9369	114	0.0895	3.864
SODIUM DISSOLVED	SULPHATE	0.9686	115	0.0876	3.867
CARBONATE	pH	0.8191	110	0.097	3.875
SPECIFIC CONDUCTANCE	TOTAL DISSOLVED SOLIDS	0.9369	114	0.0895	3.884
pH	CARBONATE	0.8191	110	0.097	3.898
SODIUM TOTAL	SODIUM DISSOLVED	0.9438	33	0.1603	3.899
CALCIUM TOTAL	HARDNESS TOTAL CACO3	0.9062	31	0.1759	3.913
MAGNESIUM DISSOLVED	MAGNESIUM TOTAL	0.8986	33	0.1221	3.920

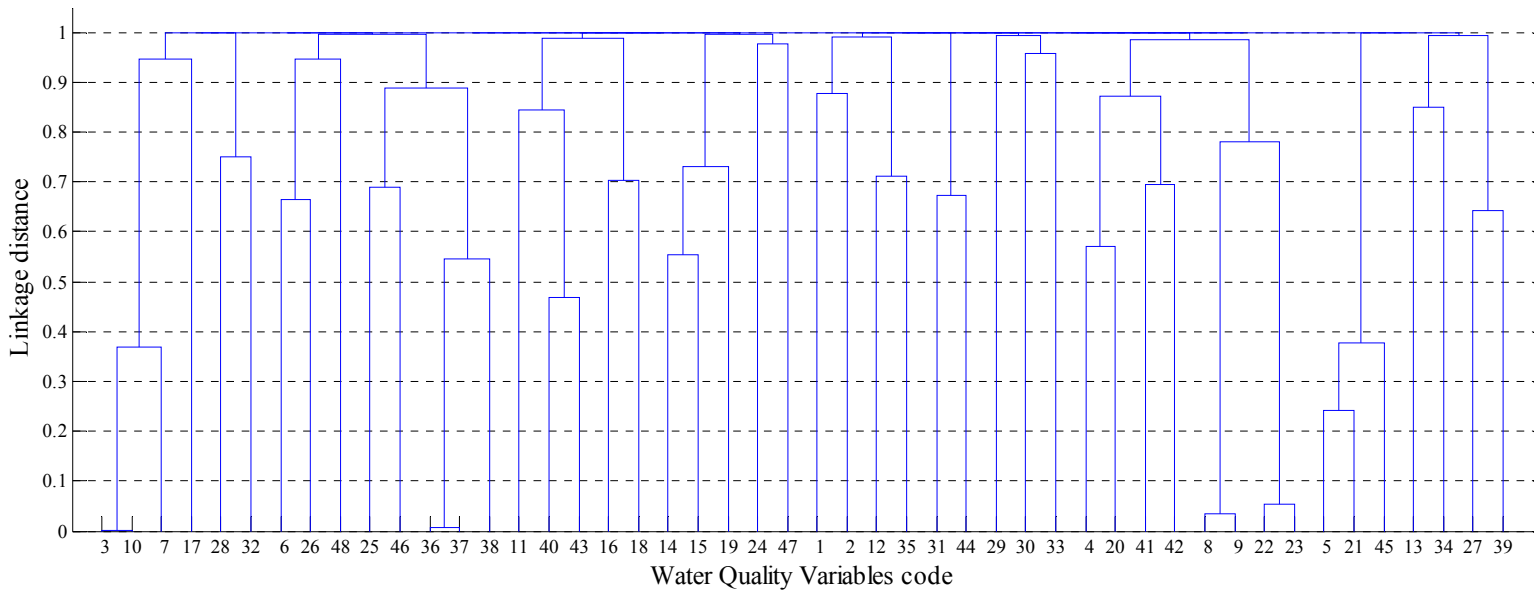
Sampling site: SK05HH0267 (SASK_19)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY TOTAL CACO3	19	NITROGEN TOTAL AMMONIA
2	BARIUM TOTAL	20	NITROGEN TOTAL KJELDAHL
3	BICARBONATE	21	OXYGEN BIOCHEMICAL DEMAND
4	CALCIUM DISSOLVED	22	OXYGEN DISSOLVED
5	CALCIUM HARDNESS	23	OXYGEN TOTAL COD
6	CARBON DISSOLVED ORGANIC	24	PH (FIELD)
7	CARBONATE	25	PHOSPHOROUS DISSOLVED ORTHO
8	CHLORIDE DISSOLVED	26	PHOSPHOROUS TOTAL
9	CHLOROPHYLL A	27	POTASSIUM DISSOLVED
10	CHROMIUM TOTAL	28	RESIDUE FIXED NONFILTRABLE
11	COLIFORMS FECAL	29	RESIDUE NONFILTRABLE
12	COLIFORMS TOTAL	30	RESIDUE VOLATILE NONFILTRABLE
13	CONDUCTANCE	31	SODIUM DISSOLVED
14	FECAL STREPTOCOCCI	32	SPECIFIC CONDUCTANCE
15	HARDNESS TOTAL CACO3	33	SULPHATE
16	IRON TOTAL	34	TEMPERATURE WATER
17	MANGANESE TOTAL	35	TOTAL DISSOLVED SOLIDS
18	NITROGEN DISSOLVED NO3 & NO2	36	pH

Discontinued Variable	Best-auxiliary	r	n_1	$var(u)$	I_a
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9926	246	0.0445	2.633
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9926	246	0.0445	2.634
RESIDUE VOLATILE NONFILTRABLE	RESIDUE NONFILTRABLE	0.8849	225	0.0494	2.642
COLIFORMS FECAL	COLIFORMS TOTAL	0.9294	173	0.0622	2.662
COLIFORMS TOTAL	COLIFORMS FECAL	0.9294	173	0.0622	2.670
SULPHATE	TOTAL DISSOLVED SOLIDS	0.8426	131	0.0821	2.690
TOTAL DISSOLVED SOLIDS	SULPHATE	0.8426	131	0.0821	2.693
MANGANESE TOTAL	IRON TOTAL	0.8331	30	0.1678	2.734
IRON TOTAL	MANGANESE TOTAL	0.8331	30	0.1678	2.734
CHLOROPHYLL A	COLIFORMS TOTAL	0.929	76	0.1267	2.739

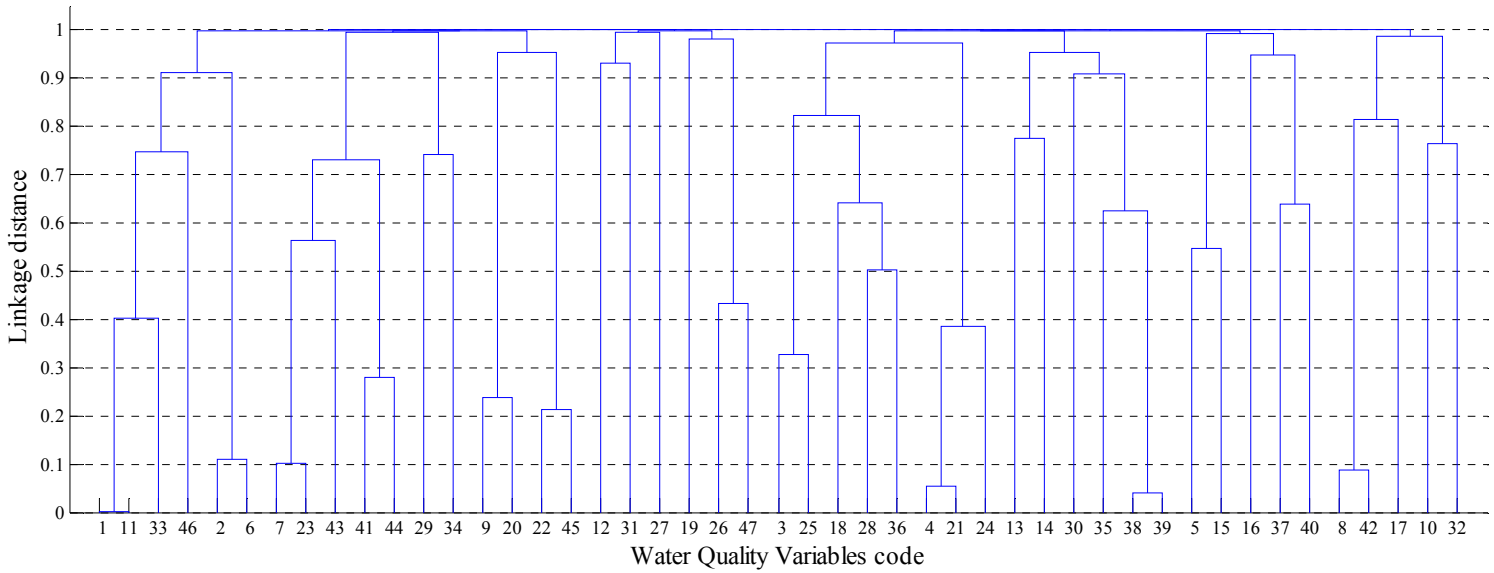
Sampling site: SK05HF0205 (SASK_20)



Code	Water quality variables	Code	Water quality variables
1	ALGAE PRESENCE AT SITE	25	MANGANESE TOTAL
2	ALGAE PRESENCE IN SAMPLE	26	NICKEL TOTAL
3	ALKALINITY PHENOLPHTHALEIN CACO3	27	NITROGEN DISSOLVED NO3 & NO2
4	ALKALINITY TOTAL CACO3	28	NITROGEN TOTAL AMMONIA
5	ALUMINUM TOTAL	29	NITROGEN TOTAL KJELDAHL
6	ARSENIC TOTAL	30	OXYGEN BIOCHEMICAL DEMAND
7	BICARBONATE	31	OXYGEN DISSOLVED
8	CALCIUM DISSOLVED	32	PHOSPHOROUS DISSOLVED ORTHO
9	CALCIUM HARDNESS	33	PHOSPHOROUS TOTAL
10	CARBONATE	34	POTASSIUM DISSOLVED
11	CHLORIDE DISSOLVED	35	POTASSIUM TOTAL
12	CHLOROPHYLL A	36	RESIDUE FIXED NONFILTRABLE
13	CHROMIUM TOTAL	37	RESIDUE NONFILTRABLE
14	COLIFORMS FECAL	38	RESIDUE VOLATILE NONFILTRABLE
15	COLIFORMS TOTAL	39	SILICON TOTAL
16	CONDUCTANCE	40	SODIUM DISSOLVED
17	COPPER TOTAL	41	SODIUM TOTAL
18	CYANIDE TOTAL	42	SPECIFIC CONDUCTANCE
19	FECAL STREPTOCOCCI	43	SULPHATE DISSOLVED
20	HARDNESS TOTAL CACO3	44	TEMPERATURE WATER
21	IRON TOTAL	45	TITANIUM TOTAL
22	MAGNESIUM DISSOLVED	46	TOTAL DISSOLVED SOLIDS
23	MAGNESIUM HARDNESS	47	ZINC TOTAL
24	MAGNESIUM TOTAL	48	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9962	217	0.0498	3.873
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9962	217	0.0498	3.875
CALCIUM HARDNESS	CALCIUM DISSOLVED	0.9825	158	0.0663	3.900
CALCIUM DISSOLVED	CALCIUM HARDNESS	0.9825	158	0.0663	3.907
MAGNESIUM HARDNESS	MAGNESIUM DISSOLVED	0.9723	84	0.1133	3.956
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.9995	74	0.1225	3.960
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.9995	74	0.1225	3.969
MAGNESIUM DISSOLVED	MAGNESIUM HARDNESS	0.9723	84	0.1133	3.986
ALUMINUM TOTAL	IRON TOTAL	0.8713	70	0.1419	3.989
IRON TOTAL	ALUMINUM TOTAL	0.8713	70	0.1419	4.008

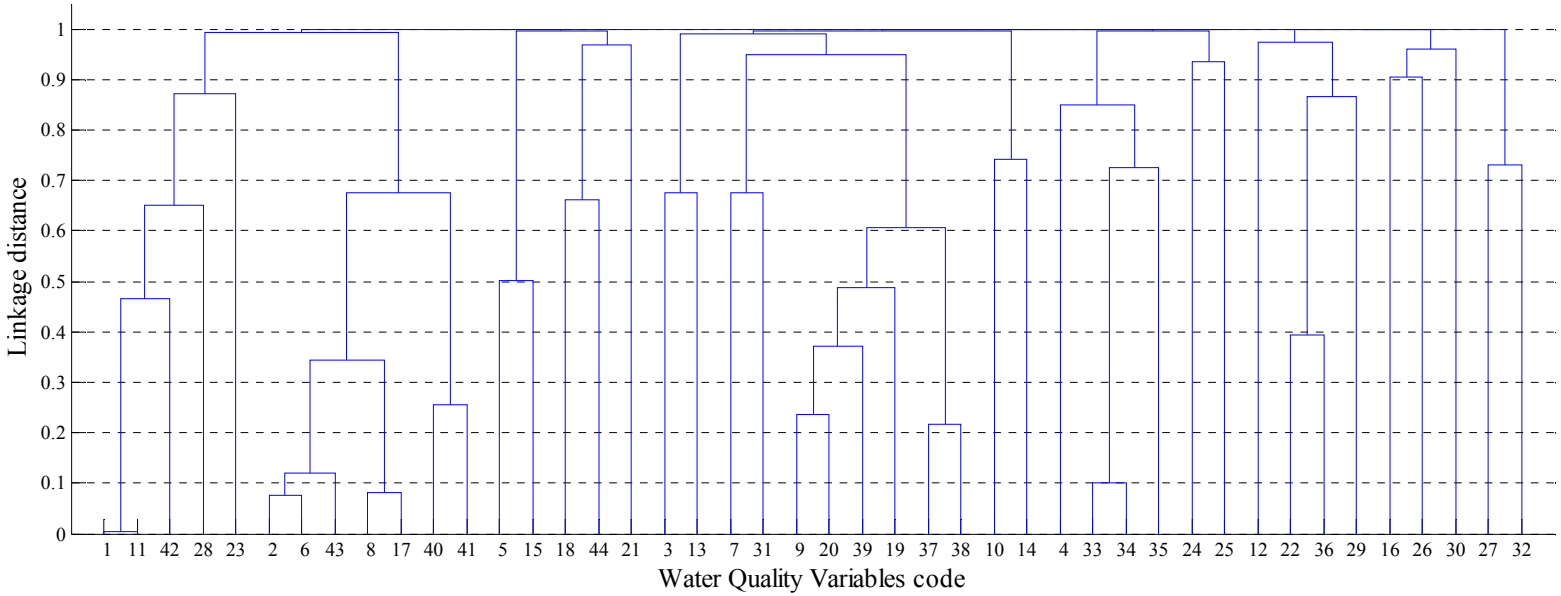
Sampling site: SK05KD0154 (SASK_21)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY PHENOLPHTHALEIN CACO3	25	NICKEL TOTAL
2	ALKALINITY TOTAL CACO3	26	NITROGEN DISSOLVED NO3 & NO2
3	ALUMINUM TOTAL	27	NITROGEN TOTAL AMMONIA
4	ARSENIC TOTAL	28	NITROGEN TOTAL KJELDAHL
5	BARIUM TOTAL	29	OIL AND GREASE
6	BICARBONATE	30	OXYGEN BIOCHEMICAL DEMAND
7	CALCIUM DISSOLVED	31	OXYGEN DISSOLVED
8	CARBON TOTAL	32	OXYGEN DISSOLVED (FIELD METER)
9	CARBON TOTAL INORGANIC	33	pH
10	CARBON TOTAL ORGANIC	34	PHOSPHOROUS DISSOLVED ORTHO
11	CARBONATE	35	PHOSPHOROUS TOTAL
12	CHLORIDE DISSOLVED	36	POTASSIUM DISSOLVED
13	CHLOROPHYLL A	37	POTASSIUM TOTAL
14	CHROMIUM TOTAL	38	RESIDUE FIXED NONFILTRABLE
15	COLIFORMS FECAL	39	RESIDUE NONFILTRABLE
16	COLIFORMS TOTAL	40	RESIDUE VOLATILE NONFILTRABLE
17	CONDUCTANCE (FIELD)	41	SODIUM DISSOLVED
18	COPPER TOTAL	42	SODIUM TOTAL
19	FECAL STREPTOCOCCI	43	SPECIFIC CONDUCTANCE
20	HARDNESS TOTAL CACO3	44	SULPHATE
21	IRON TOTAL	45	SULPHATE DISSOLVED
22	MAGNESIUM DISSOLVED	46	TEMPERATURE WATER
23	MAGNESIUM TOTAL	47	ZINC TOTAL
24	MANGANESE TOTAL		

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
NICKEL TOTAL	ALUMINUM TOTAL	0.8198	33	0.0599	5.207
ALUMINUM TOTAL	NICKEL TOTAL	0.8198	33	0.0599	5.228
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9796	110	0.0905	5.326
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9796	110	0.0905	5.327
BICARBONATE	ALKALINITY TOTAL CACO3	0.9429	58	0.1567	5.391
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.9992	39	0.1914	5.409
ALKALINITY TOTAL CACO3	BICARBONATE	0.9429	58	0.1567	5.423
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.9992	39	0.1914	5.431
ARSENIC TOTAL	IRON TOTAL	0.9721	26	0.2376	5.446
MAGNESIUM DISSOLVED	SULPHATE DISSOLVED	0.8864	26	0.2305	5.454
IRON TOTAL	ARSENIC TOTAL	0.9721	26	0.2376	5.459
SULPHATE DISSOLVED	MAGNESIUM DISSOLVED	0.8864	26	0.2305	5.474
MAGNESIUM TOTAL	CALCIUM DISSOLVED	0.9471	14	0.3411	5.538
CALCIUM DISSOLVED	MAGNESIUM TOTAL	0.9471	14	0.3411	5.558
SULPHATE	SODIUM DISSOLVED	0.849	17	0.3352	5.567
SODIUM DISSOLVED	SULPHATE	0.849	17	0.3352	5.568
SODIUM TOTAL	CARBON TOTAL	-0.9557	4	0.5679	5.707
CARBON TOTAL	SODIUM TOTAL	-0.9557	4	0.5679	5.748
HARDNESS TOTAL CACO3	CARBON TOTAL INORGANIC	0.8727	4	0.8117	5.876
CARBON TOTAL INORGANIC	HARDNESS TOTAL CACO3	0.8727	4	0.8117	5.899

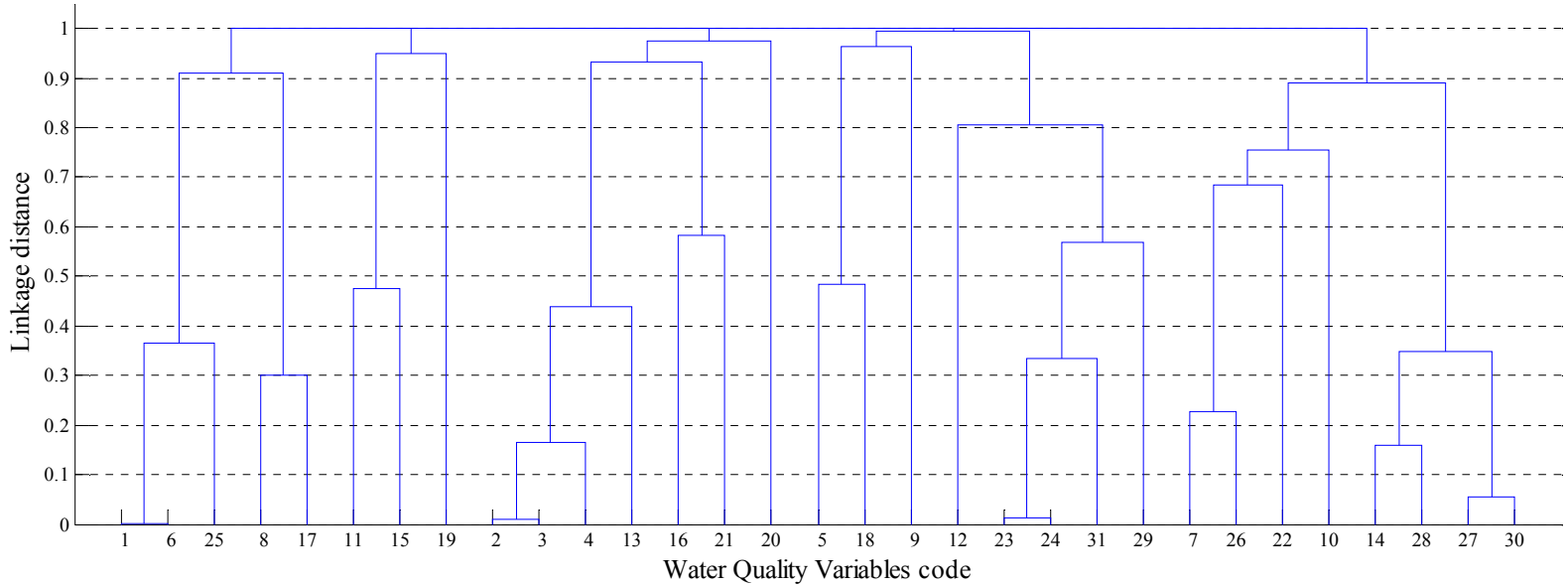
Sampling site: SK05KD0089 (SASK_22)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY PHENOLPHTHALEIN CACO3	23	NITROGEN TOTAL AMMONIA
2	ALKALINITY TOTAL CACO3	24	NITROGEN TOTAL KJELDAHL
3	ALUMINUM TOTAL	25	OXYGEN BIOCHEMICAL DEMAND
4	ARSENIC TOTAL	26	OXYGEN DISSOLVED (FIELD)
5	BARIUM TOTAL	27	OXYGEN TOTAL COD
6	BICARBONATE	28	pH
7	BORON TOTAL	29	PHOSPHOROUS DISSOLVED ORTHO
8	CALCIUM DISSOLVED	30	PHOSPHOROUS TOTAL
9	CALCIUM TOTAL	31	POTASSIUM DISSOLVED
10	CARBON DISSOLVED ORGANIC	32	POTASSIUM TOTAL
11	CARBONATE	33	RESIDUE FIXED NONFILTRABLE
12	CHLORIDE DISSOLVED	34	RESIDUE NONFILTRABLE
13	CHLOROPHYLL A	35	RESIDUE VOLATILE NONFILTRABLE
14	COLIFORMS TOTAL	36	SILICON TOTAL
15	CONDUCTANCE	37	SODIUM DISSOLVED
16	COPPER TOTAL	38	SODIUM TOTAL
17	HARDNESS TOTAL CACO3	39	SPECIFIC CONDUCTANCE
18	IRON TOTAL	40	STRONTIUM TOTAL
19	MAGNESIUM DISSOLVED	41	SULPHATE
20	MAGNESIUM TOTAL	42	TEMPERATURE WATER
21	MANGANESE TOTAL	43	TOTAL DISSOLVED SOLIDS
22	NITROGEN DISSOLVED NO3 & NO2	44	TURBIDITY

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
BICARBONATE	ALKALINITY TOTAL CACO3	0.9607	95	0.1032	4.923
ALKALINITY TOTAL CACO3	BICARBONATE	0.9607	95	0.1032	4.925
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED	0.9589	91	0.107	4.927
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.9589	91	0.107	4.930
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9489	87	0.1118	4.932
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9489	87	0.1118	4.937
TOTAL DISSOLVED SOLIDS	ALKALINITY TOTAL CACO3	0.9433	75	0.1268	4.947
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.9976	38	0.1976	4.997
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.9976	38	0.1976	4.997
SODIUM TOTAL	SODIUM DISSOLVED	0.8847	37	0.5572	5.298
STRONTIUM TOTAL	SULPHATE	0.863	7	0.5856	5.301
SULPHATE	STRONTIUM TOTAL	0.863	7	0.5856	5.345
SODIUM DISSOLVED	SODIUM TOTAL	0.8847	37	0.5572	5.350

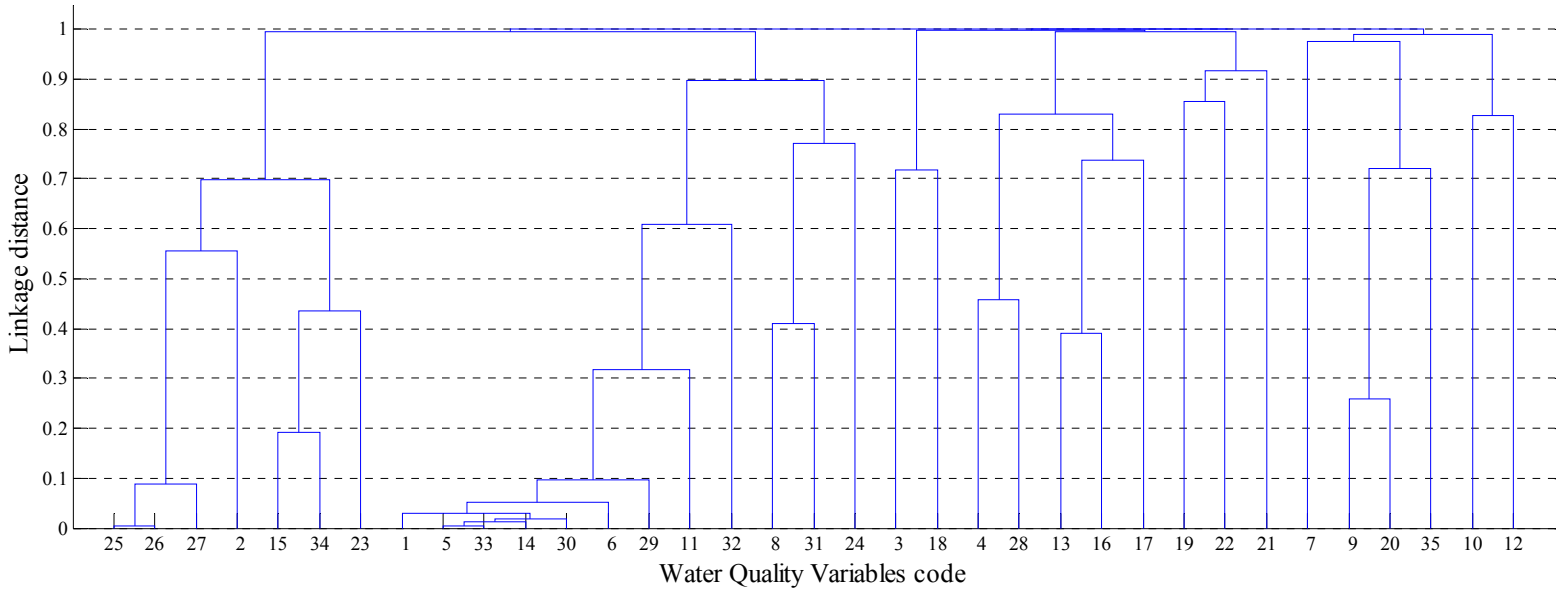
Sampling site: SK05MC0038 (SASK_23)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY PHENOLPHTHALEIN CACO3	17	OXYGEN BIOCHEMICAL DEMAND
2	ALKALINITY TOTAL CACO3	18	OXYGEN TOTAL COD
3	BICARBONATE	19	pH
4	CALCIUM DISSOLVED	20	PHOSPHOROUS DISSOLVED ORTHO
5	CARBON DISSOLVED ORGANIC	21	PHOSPHOROUS TOTAL
6	CARBONATE	22	POTASSIUM DISSOLVED
7	CHLORIDE DISSOLVED	23	RESIDUE FIXED NONFILTRABLE
8	CHLOROPHYLL A	24	RESIDUE NONFILTRABLE
9	COLIFORMS TOTAL	25	RESIDUE VOLATILE NONFILTRABLE
10	CONDUCTANCE	26	SODIUM DISSOLVED
11	FECAL STREPTOCOCCI	27	SPECIFIC CONDUCTANCE
12	FLUORIDE DISSOLVED	28	SULPHATE DISSOLVED
13	HARDNESS TOTAL CACO3	29	TEMPERATURE WATER
14	MAGNESIUM DISSOLVED	30	TOTAL DISSOLVED SOLIDS
15	NITROGEN TOTAL AMMONIA	31	TURBIDITY
16	NITROGEN TOTAL KJELDAHL		

Discontinued Variable	**Best-auxiliary**	***r***	n_1	***var(u)***	I_a
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9936	91	0.1048	3.638
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9936	91	0.1048	3.638
BICARBONATE	ALKALINITY TOTAL CACO3	0.9956	67	0.1324	3.664
CALCIUM DISSOLVED	ALKALINITY TOTAL CACO3	0.9135	75	0.1296	3.665
SODIUM DISSOLVED	CHLORIDE DISSOLVED	0.8798	74	0.1343	3.672
ALKALINITY TOTAL CACO3	CALCIUM DISSOLVED	0.9135	75	0.1296	3.674
TURBIDITY	RESIDUE FIXED NONFILTRABLE	0.8159	29	0.1817	3.677
CHLORIDE DISSOLVED	SODIUM DISSOLVED	0.8798	74	0.1343	3.680
TOTAL DISSOLVED SOLIDS	SPECIFIC CONDUCTANCE	0.9721	50	0.1701	3.696
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.9994	34	0.206	3.713
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.9994	34	0.206	3.715
SPECIFIC CONDUCTANCE	TOTAL DISSOLVED SOLIDS	0.9721	50	0.1701	3.727
CHLOROPHYLL A	OXYGEN BIOCHEMICAL DEMAND	0.8362	19	0.3102	3.820
SULPHATE DISSOLVED	MAGNESIUM DISSOLVED	0.9163	38	0.3308	3.842
OXYGEN BIOCHEMICAL DEMAND	CHLOROPHYLL A	0.8362	19	0.3102	3.858
MAGNESIUM DISSOLVED	SULPHATE DISSOLVED	0.9163	38	0.3308	3.880

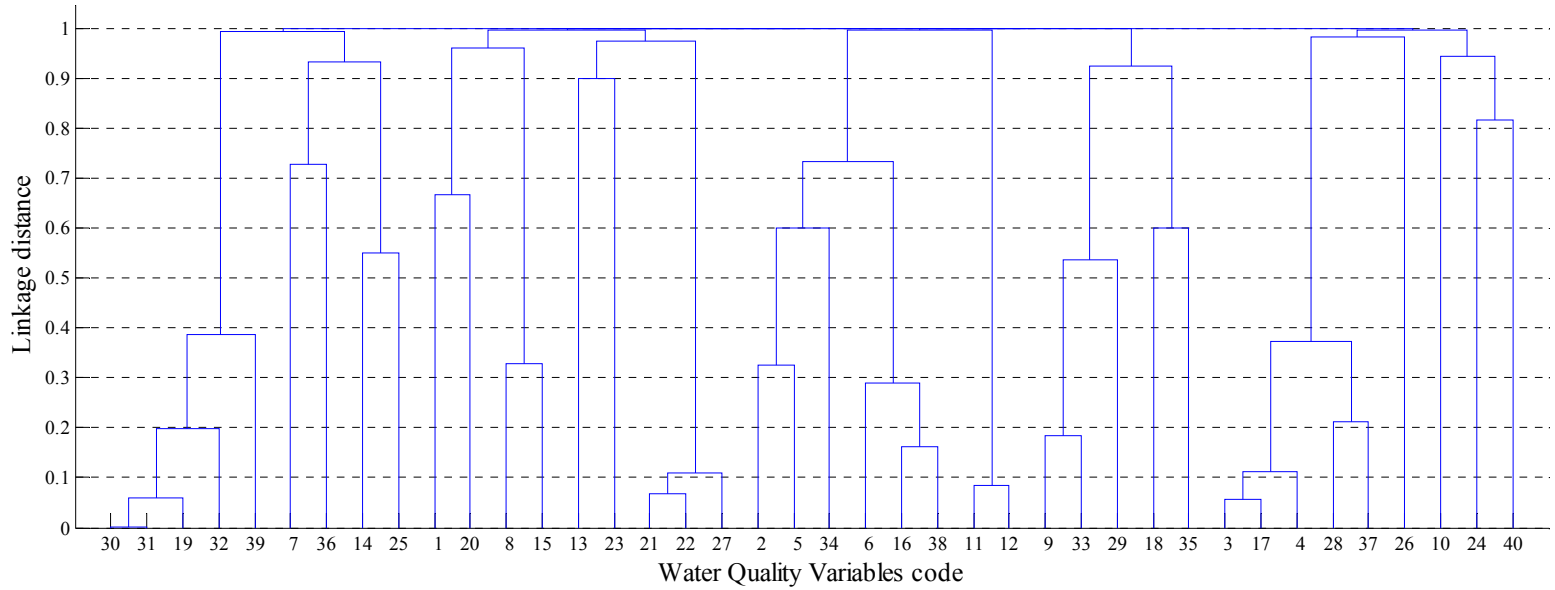
Sampling site: SK05AD0041 (SASK_24)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY TOTAL CACO3	19	NITROGEN TOTAL KJELDAHL
2	ALUMINUM TOTAL	20	OXYGEN BIOCHEMICAL DEMAND
3	ARSENIC TOTAL	21	OXYGEN DISSOLVED (FIELD)
4	BARIUM TOTAL	22	OXYGEN TOTAL COD
5	BICARBONATE	23	PHOSPHOROUS TOTAL
6	CALCIUM DISSOLVED	24	POTASSIUM DISSOLVED
7	CARBON DISSOLVED ORGANIC	25	RESIDUE FIXED NONFILTRABLE
8	CHLORIDE DISSOLVED	26	RESIDUE NONFILTRABLE
9	CHLOROPHYLL A	27	RESIDUE VOLATILE NONFILTRABLE
10	COLIFORMS TOTAL	28	SILICON TOTAL
11	CONDUCTANCE	29	SODIUM DISSOLVED
12	FECAL STREPTOCOCCI	30	SPECIFIC CONDUCTANCE
13	FLUORIDE DISSOLVED	31	SULPHATE DISSOLVED
14	HARDNESS TOTAL CACO3	32	TEMPERATURE WATER
15	IRON TOTAL	33	TOTAL DISSOLVED SOLIDS
16	MAGNESIUM DISSOLVED	34	TURBIDITY
17	MANGANESE TOTAL	35	pH
18	NITROGEN TOTAL AMMONIA		

Discontinued Variable	**Best-auxiliary**	***r***	n_1	***var(u)***	I_a
TOTAL DISSOLVED SOLIDS	CONDUCTANCE (field)	0.8597	34	0.0164	3.888
CONDUCTANCE (field)	TOTAL DISSOLVED SOLIDS	0.8597	34	0.0164	3.896
HARDNESS TOTAL CACO3	SPECIFIC CONDUCTANCE	0.9904	78	0.1185	4.131
SPECIFIC CONDUCTANCE	HARDNESS TOTAL CACO3	0.9904	78	0.1185	4.131
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.983	78	0.1192	4.132
SODIUM DISSOLVED	SPECIFIC CONDUCTANCE	0.9703	78	0.1204	4.133
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9979	70	0.1279	4.139
ALKALINITY TOTAL CACO3	HARDNESS TOTAL CACO3	0.9885	71	0.1276	4.139
BICARBONATE	HARDNESS TOTAL CACO3	0.9931	69	0.1299	4.141
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9979	70	0.1279	4.143
RESIDUE VOLATILE NONFILTRABLE	RESIDUE NONFILTRABLE	0.9642	47	0.1817	4.186
OXYGEN BIOCHEMICAL DEMAND	CHLOROPHYLL A	0.8601	24	0.25	4.241
IRON TOTAL	TURBIDITY	0.8991	22	0.2687	4.263
CHLOROPHYLL A	OXYGEN BIOCHEMICAL DEMAND	0.8601	24	0.25	4.275
TURBIDITY	IRON TOTAL	0.8991	22	0.2687	4.295

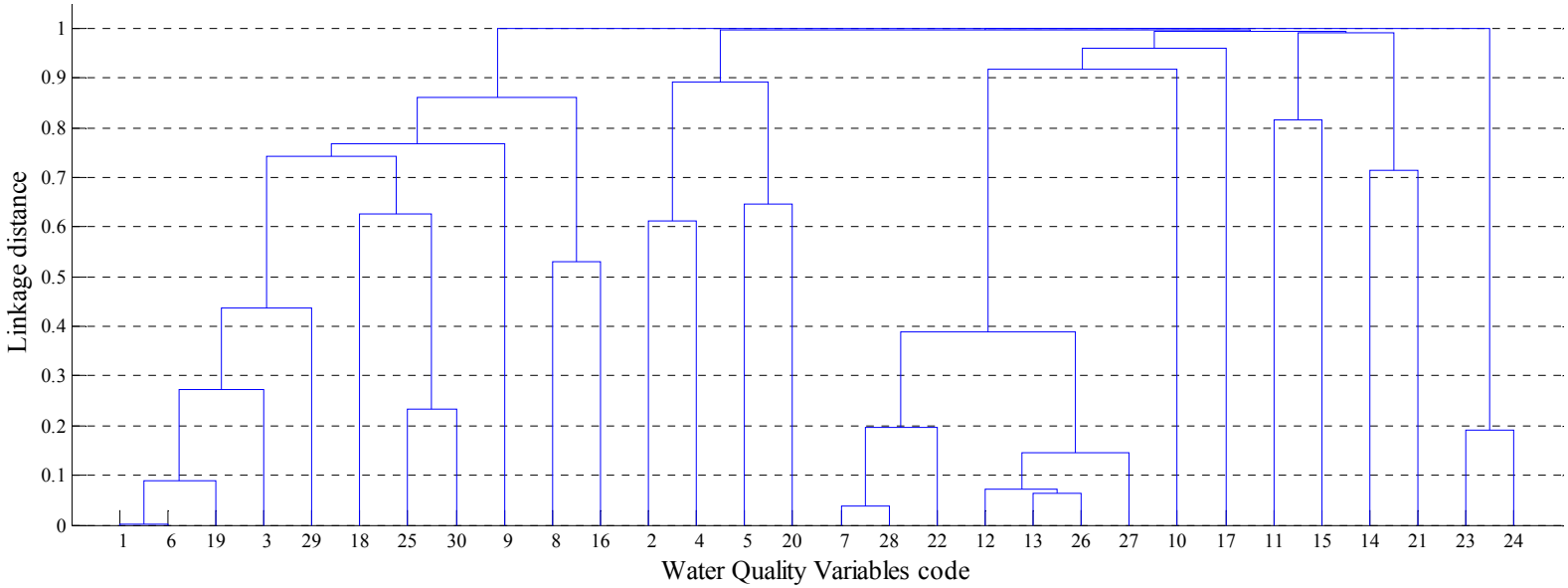
Sampling site: SK05GG0023 (SASK_25)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY PHENOLPHTHALEIN CACO3	21	NITROGEN TOTAL AMMONIA
2	ALKALINITY TOTAL CACO3	22	NITROGEN TOTAL KJELDAHL
3	ALUMINUM TOTAL	23	OXYGEN BIOCHEMICAL DEMAND
4	BARIUM TOTAL	24	OXYGEN DISSOLVED (FIELD)
5	BICARBONAT	25	OXYGEN TOTAL COD
6	CALCIUM DISSOLVED	26	PH (FIELD)
7	CARBON DISSOLVED ORGANIC	27	PHOSPHOROUS DISSOLVED ORTHO
8	CARBONATE	28	PHOSPHOROUS TOTAL
9	CHLORID DISSOLVED	29	POTASSIUM DISSOLVED
10	CHLOROPHYLL A	30	RESIDUE FIXED NONFILTRABLE
11	COLIFORMS FECAL	31	RESIDUE NONFILTRABL
12	COLIFORMS TOTAL	32	RESIDUE VOLATIL NONFILTRABL
13	CONDUCTANC	33	SODIUM DISSOLVED
14	COPPER TOTAL	34	SPECIFIC CONDUCTANCE
15	FECAL STREPTOCOCCI	35	SULPHATE DISSOLVED
16	HARDNESS TOTALCACO3	36	TEMPERATURE WATER
17	IRON TOTAL	37	TITANIUM TOTAL
18	MAGNESIUM DISSOLVED	38	TOTAL DISSOLVED SOLIDS
19	MANGANES TOTAL	39	TURBIDITY
20	NITROGEN DISSOLVED NO3 & NO2	40	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
TITANIUM TOTAL	PHOSPHOROUS TOTAL	0.8869	34	0.051	3.293
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABL	0.9988	226	0.048	3.372
RESIDUE NONFILTRABL	RESIDUE FIXED NONFILTRABLE	0.9988	226	0.048	3.374
RESIDUE VOLATIL NONFILTRABL	RESIDUE NONFILTRABL	0.9247	206	0.0531	3.381
PHOSPHOROUS TOTAL	TITANIUM TOTAL	0.8869	34	0.051	3.381
SODIUM DISSOLVED	CHLORID DISSOLVED	0.9035	166	0.065	3.402
CHLORID DISSOLVED	SODIUM DISSOLVED	0.9035	166	0.065	3.406
CALCIUM DISSOLVED	HARDNESS TOTALCACO3	0.9076	152	0.0703	3.406
HARDNESS TOTALCACO3	CALCIUM DISSOLVED	0.9076	152	0.0703	3.406
NITROGEN TOTAL AMMONIA	NITROGEN TOTAL KJELDAHL	0.9652	143	0.0728	3.409
BICARBONAT	ALKALINITY TOTAL CACO3	0.8214	150	0.0729	3.411
PHOSPHOROUS DISSOLVED ORTHO	NITROGEN TOTAL KJELDAHL	0.9429	134	0.0776	3.416
TOTAL DISSOLVED SOLIDS	HARDNESS TOTALCACO3	0.9148	125	0.0834	3.423
ALKALINITY TOTAL CACO3	BICARBONAT	0.8214	150	0.0729	3.424
NITROGEN TOTAL KJELDAHL	NITROGEN TOTAL AMMONIA	0.9652	143	0.0728	3.424
COLIFORMS FECAL	COLIFORMS TOTAL	0.9564	64	0.1426	3.500
COLIFORMS TOTAL	COLIFORMS FECAL	0.9564	64	0.1426	3.503
MANGANES TOTAL	RESIDUE FIXED NONFILTRABLE	0.9743	33	0.1872	3.509
CARBONATE	FECAL STREPTOCOCCI	0.8199	63	0.1628	3.528
FECAL STREPTOCOCCI	CARBONATE	0.8199	63	0.1628	3.539
IRON TOTAL	ALUMINUM TOTAL	0.9714	37	0.2903	3.613
ALUMINUM TOTAL	IRON TOTAL	0.9714	37	0.2903	3.634
BARIUM TOTAL	ALUMINUM TOTAL	0.9486	37	0.3629	3.675

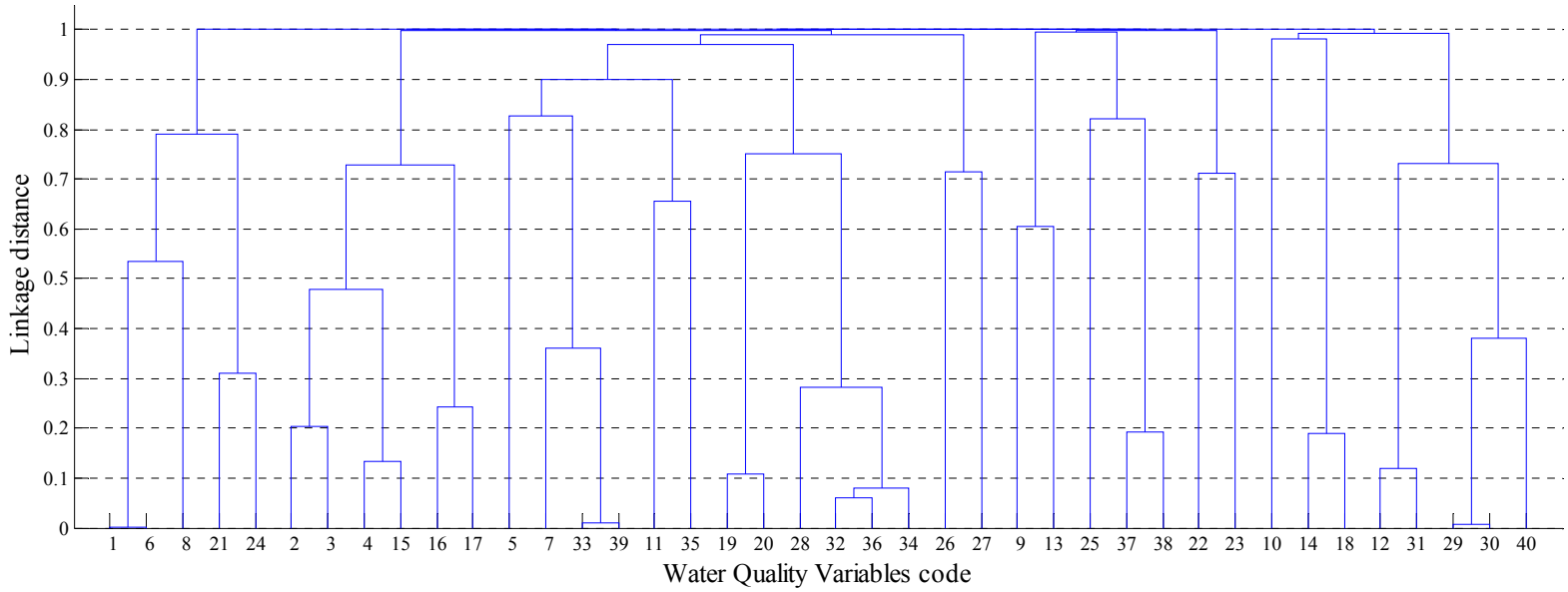
Sampling site: SK05JL0129 (SASK_26)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY PHENOLPHTHALEIN CACO3	16	OXYGEN BIOCHEMICAL DEMAND
2	ALKALINITY TOTAL CACO3	17	OXYGEN DISSOLVED (FIELD)
3	BICARBONATE	18	OXYGEN TOTAL COD
4	CALCIUM DISSOLVED	19	pH
5	CARBON DISSOLVED ORGANIC	20	PHOSPHOROUS DISSOLVED ORTHO
6	CARBONATE	21	PHOSPHOROUS TOTAL
7	CHLORIDE DISSOLVED	22	POTASSIUM DISSOLVED
8	CHLOROPHYLL A	23	RESIDUE FIXED NONFILTRABLE
9	COLIFORMS TOTAL	24	RESIDUE NONFILTRABLE
10	FECAL STREPTOCOCCI	25	RESIDUE VOLATILE NONFILTRABLE
11	FLUORIDE DISSOLVED	26	SODIUM DISSOLVED
12	HARDNESS TOTAL CACO3	27	SPECIFIC CONDUCTANCE
13	MAGNESIUM DISSOLVED	28	SULPHATE DISSOLVED
14	NITROGEN TOTAL AMMONIA	29	TEMPERATURE WATER
15	NITROGEN TOTAL KJELDAHL	30	TURBIDITY

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.8993	64	0.1503	3.813
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.8993	64	0.1503	3.816
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.99	45	0.1739	3.823
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.99	45	0.1739	3.823
BICARBONATE	pH	-0.8531	54	0.1849	3.847
SODIUM DISSOLVED	MAGNESIUM DISSOLVED	0.9671	42	0.202	3.851
MAGNESIUM DISSOLVED	SODIUM DISSOLVED	0.9671	42	0.202	3.851
HARDNESS TOTAL CACO3	SODIUM DISSOLVED	0.9641	42	0.2038	3.853
pH	BICARBONATE	-0.8531	54	0.1849	3.859
POTASSIUM DISSOLVED	CHLORIDE DISSOLVED	0.8964	42	0.2431	3.895
SPECIFIC CONDUCTANCE	SODIUM DISSOLVED	0.9497	41	0.2206	3.898
SULPHATE DISSOLVED	CHLORIDE DISSOLVED	0.9803	37	0.2614	3.905
CHLORIDE DISSOLVED	POTASSIUM DISSOLVED	0.8964	42	0.2431	3.922
TURBIDITY	RESIDUE VOLATILE NONFILTRABLE	0.876	39	0.3268	3.973
RESIDUE VOLATILE NONFILTRABLE	TURBIDITY	0.876	39	0.3268	3.998

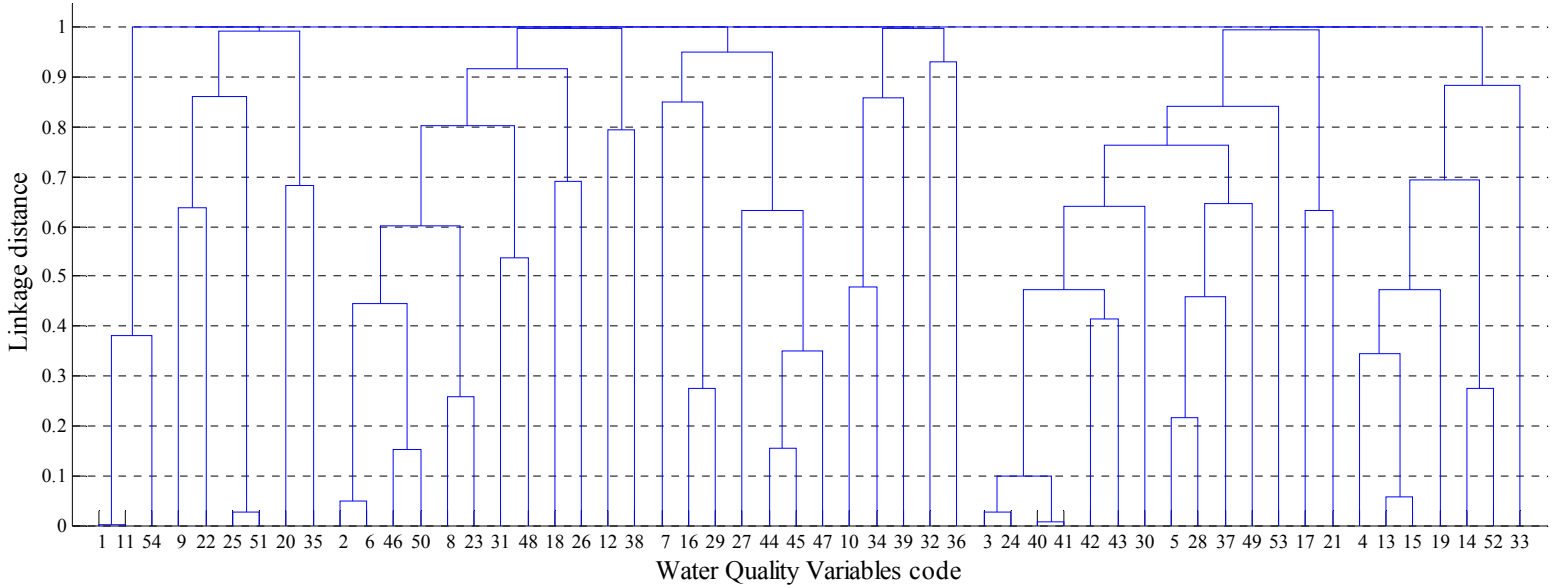
Sampling site: SK05JF0092 (SASK_27)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY PHENOLPHTHALEIN CACO3	21	OXYGEN BIOCHEMICAL DEMAND
2	ALKALINITY TOTAL CACO3	22	OXYGEN DISSOLVED
3	BICARBONATE	23	OXYGEN DISSOLVED
4	CALCIUM DISSOLVED	24	OXYGEN TOTAL COD
5	CARBON DISSOLVED ORGANIC	25	pH
6	CARBONATE	26	PHOSPHOROUS DISSOLVED ORTHO
7	CHLORIDE DISSOLVED	27	PHOSPHOROUS TOTAL
8	CHLOROPHYLL A	28	POTASSIUM DISSOLVED
9	COLIFORMS FECAL	29	RESIDUE FIXED NONFILTRABLE
10	COLIFORMS TOTAL	30	RESIDUE NONFILTRABLE
11	CONDUCTANCE	31	RESIDUE VOLATILE NONFILTRABLE
12	ESCHERICHIA COLI	32	SODIUM DISSOLVED
13	FECAL STREPTOCOCCI	33	SODIUM TOTAL
14	FLUORIDE DISSOLVED	34	SPECIFIC CONDUCTANCE
15	HARDNESS TOTAL CACO3	35	SULPHATE
16	MAGNESIUM DISSOLVED	36	SULPHATE DISSOLVED
17	MAGNESIUM TOTAL	37	TEMPERATURE AIR
18	NITROGEN DISSOLVED NO3 & NO2	38	TEMPERATURE WATER
19	NITROGEN TOTAL AMMONIA	39	TOTAL DISSOLVED SOLIDS
20	NITROGEN TOTAL KJELDAHL	40	TURBIDITY

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.997	224	0.0484	3.321
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.997	224	0.0484	3.321
SULPHATE DISSOLVED	POTASSIUM DISSOLVED	0.8659	33	0.0956	3.323
NITROGEN TOTAL AMMONIA	NITROGEN TOTAL KJELDAHL	0.9443	194	0.0558	3.334
NITROGEN TOTAL KJELDAHL	NITROGEN TOTAL AMMONIA	0.9443	194	0.0558	3.339
BICARBONATE	ALKALINITY TOTAL CACO3	0.8922	161	0.067	3.351
TEMPERATURE AIR	TEMPERATURE WATER	0.8988	142	0.0749	3.361
ALKALINITY TOTAL CACO3	BICARBONATE	0.8922	161	0.067	3.362
SODIUM DISSOLVED	SPECIFIC CONDUCTANCE	0.9632	124	0.0824	3.370
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.9314	124	0.0834	3.372
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED	0.9314	124	0.0834	3.372
TEMPERATURE WATER	TEMPERATURE AIR	0.8988	142	0.0749	3.375
POTASSIUM DISSOLVED	SODIUM DISSOLVED	0.8601	119	0.089	3.379
SPECIFIC CONDUCTANCE	SODIUM DISSOLVED	0.9632	124	0.0824	3.390
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.998	91	0.1044	3.393
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.998	91	0.1044	3.405
OXYGEN TOTAL COD	OXYGEN BIOCHEMICAL DEMAND	0.831	41	0.2983	3.587
MAGNESIUM TOTAL	MAGNESIUM DISSOLVED	0.8695	14	0.3758	3.622
OXYGEN BIOCHEMICAL DEMAND	OXYGEN TOTAL COD	0.831	41	0.2983	3.647
SODIUM TOTAL	TOTAL DISSOLVED SOLIDS	0.9953	3	0.4655	3.678
MAGNESIUM DISSOLVED	MAGNESIUM TOTAL	0.8695	14	0.3758	3.696
ESCHERICHIA COLI	RESIDUE VOLATILE NONFILTRABLE	0.9387	5	0.5585	3.752
TOTAL DISSOLVED SOLIDS	SODIUM TOTAL	0.9953	3	0.4655	3.758
RESIDUE VOLATILE NONFILTRABLE	ESCHERICHIA COLI	0.9387	5	0.5585	3.846
FLUORIDE DISSOLVED	NITROGEN DISSOLVED NO3 & NO2	-0.8996	3	0.8759	3.935
NITROGEN DISSOLVED NO3 & NO2	FLUORIDE DISSOLVED	-0.8996	3	0.8759	4.023

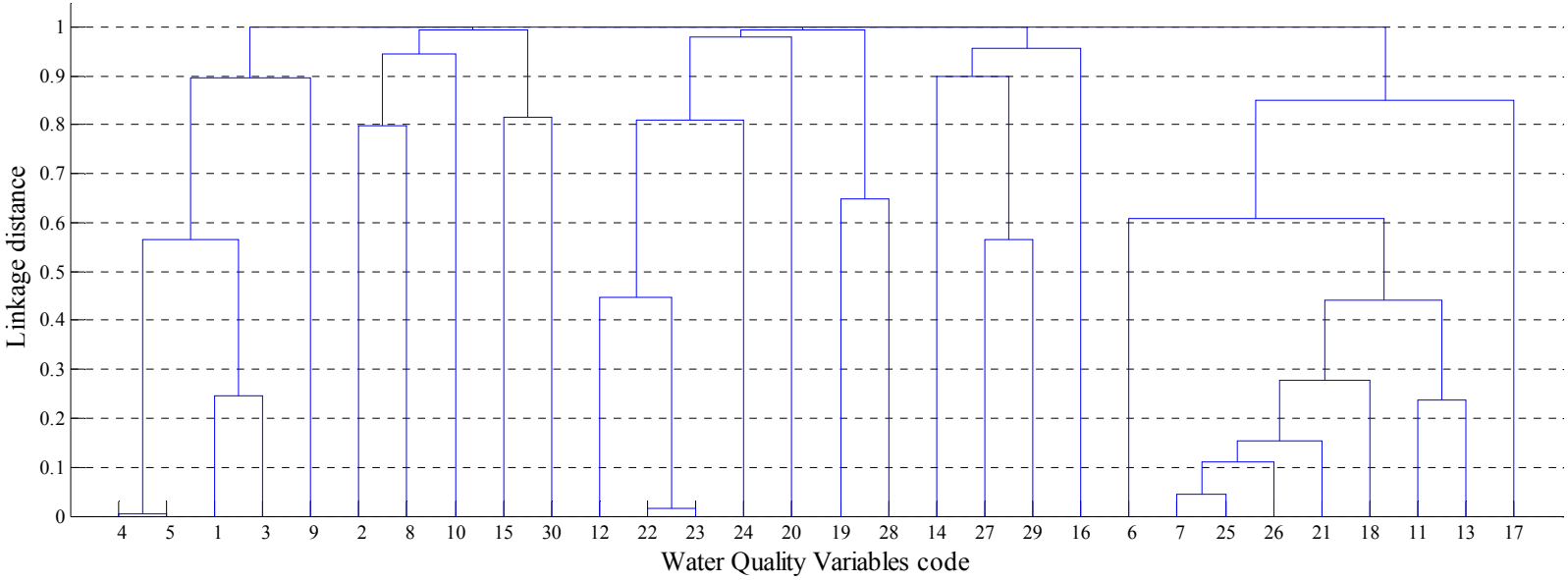
Sampling site: SK05HB0087 (SASK_28)



Code	Water quality variables	Code	Water quality variables	Code	Water quality variables
1	ALKALINITY PHENOLPHTHALEIN CACO3	19	COPPER TOTAL	37	PHOSPHOROUS TOTAL
2	ALKALINITY TOTAL CACO3	20	CYANIDE TOTAL	38	POTASSIUM DISSOLVED
3	ALUMINUM TOTAL	21	FECAL STREPTOCOCCI	39	POTASSIUM TOTAL
4	ARSENIC TOTAL	22	FLUORIDE DISSOLVED	40	RESIDUE FIXED NON RABLE
5	BARIUM TOTAL	23	HARDNESS TOTAL CACO3	41	RESIDUE NON RABLE
6	BICARBONATE	24	IRON TOTAL	42	RESIDUE VOLATILE NON RABLE
7	BORON TOTAL	25	LEAD TOTAL	43	SILICON TOTAL
8	CALCIUM DISSOLVED	26	MAGNESIUM DISSOLVED	44	SODIUM DISSOLVED
9	CALCIUM TOTAL	27	MAGNESIUM TOTAL	45	SODIUM TOTAL
10	CARBON DISSOLVED ORGANIC	28	MANGANESE TOTAL	46	SPECIFIC CONDUCTANCE
11	CARBONATE	29	MERCURY TOTAL	47	SULPHATE
12	CHLORIDE DISSOLVED	30	NICKEL TOTAL	48	TEMPERATURE WATER
13	CHLOROPHYLL A	31	NITROGEN DISSOLVED NO3 & NO2	49	TITANIUM TOTAL
14	CHROMIUM TOTAL	32	NITROGEN TOTAL AMMONIA	50	TOTAL DISSOLVED SOLIDS
15	COBALT TOTAL	33	NITROGEN TOTAL KJELDAHL	51	TURBIDITY
16	COLIFORMS FECAL	34	OXYGEN BIOCHEMICAL DEMAND	52	VANADIUM TOTAL
17	COLIFORMS TOTAL	35	OXYGEN DISSOLVED (FIELD)	53	ZINC TOTAL
18	CONDUCTANCE	36	PHOSPHOROUS DISSOLVED ORTHO	54	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
RESIDUE FIXED NON RABLE	RESIDUE NON RABLE	0.9963	235	0.0464	4.639
RESIDUE NON RABLE	RESIDUE FIXED NON RABLE	0.9963	235	0.0464	4.640
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.8615	171	0.064	4.668
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED	0.8615	171	0.064	4.669
BICARBONATE	ALKALINITY TOTAL CACO3	0.9754	150	0.0696	4.674
TOTAL DISSOLVED SOLIDS	SPECIFIC CONDUCTANCE	0.9215	145	0.073	4.680
ALKALINITY TOTAL CACO3	BICARBONATE	0.9754	150	0.0696	4.688
SPECIFIC CONDUCTANCE	TOTAL DISSOLVED SOLIDS	0.9215	145	0.073	4.692
ALUMINUM TOTAL	ALUMINUM TOTAL	0.9864	89	0.1071	4.719
ALUMINUM TOTAL	RESIDUE NONFILTRABLE	0.9512	92	0.1066	4.720
ALKALINITY PHENOLPHTHALEIN CACO3	CARBONATE	0.9993	78	0.1177	4.730
CARBONATE	ALKALINITY PHENOLPHTHALEIN CACO3	0.9993	78	0.1177	4.736
BARIUM TOTAL	MANGANESE TOTAL	0.8848	83	0.121	4.736
MANGANESE TOTAL	BARIUM TOTAL	0.8848	83	0.121	4.738
SODIUM TOTAL	SODIUM DISSOLVED	0.9193	58	0.1608	4.781
VANADIUM TOTAL	CHROMIUM TOTAL	0.8508	26	0.2278	4.814
SODIUM DISSOLVED	SODIUM TOTAL	0.9193	58	0.1608	4.817
CHROMIUM TOTAL	VANADIUM TOTAL	0.8508	26	0.2278	4.861
MERCURY TOTAL	COLIFORMS FECAL	0.8509	19	0.3077	4.896
COLIFORMS FECAL	MERCURY TOTAL	0.8509	19	0.3077	4.959
COBALT TOTAL	CHLOROPHYLL A	0.9715	9	0.3939	4.963
TURBIDITY	LEAD TOTAL	0.9865	6	0.4258	5.004
LEAD TOTAL	TURBIDITY	0.9865	6	0.4258	5.005
CHLOROPHYLL A	COBALT TOTAL	0.9715	9	0.3939	5.006

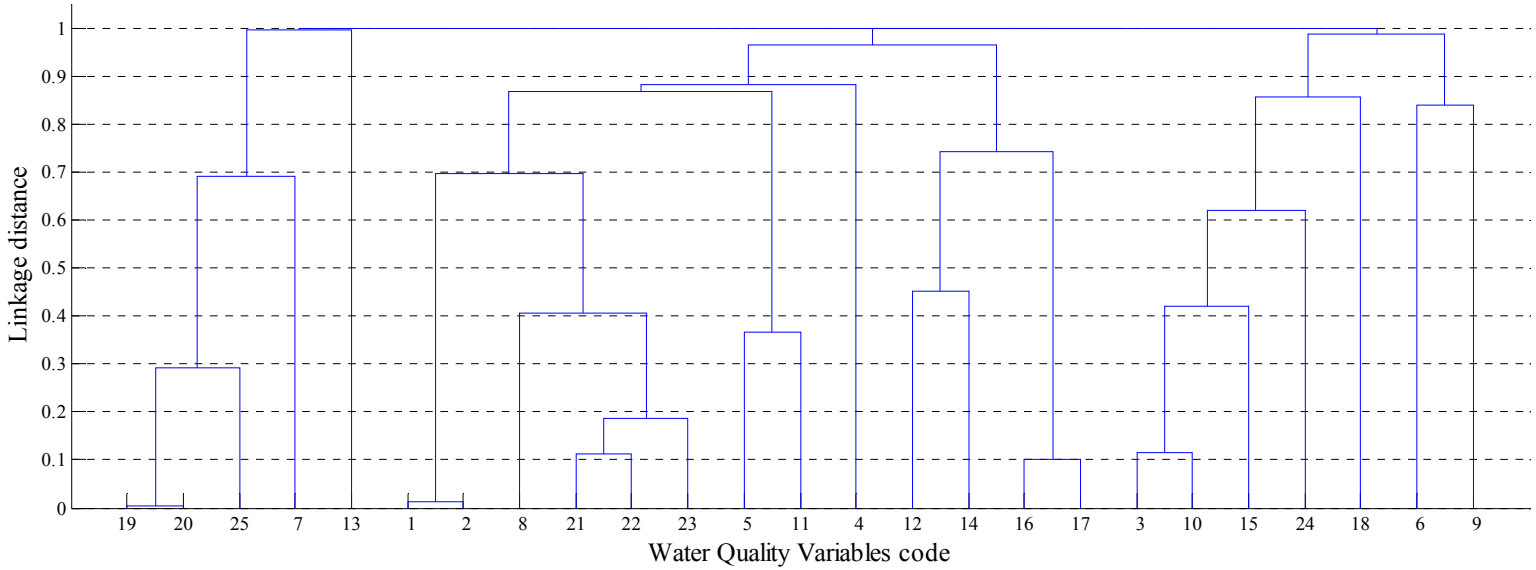
Sampling site: SK05HH0176 (SASK_29)



Code	Water quality variables	Code	Water quality variables
1	ALKALINITY TOTAL CACO3	16	NITROGEN TOTAL AMMONIA
2	BARIUM TOTAL	17	NITROGEN TOTAL KJELDAHL
3	BICARBONATE	18	OXYGEN BIOCHEMICAL DEMAND
4	CALCIUM DISSOLVED	19	OXYGEN DISSOLVED (FIELD)
5	CALCIUM HARDNESS	20	PHOSPHOROUS TOTAL
6	CARBON DISSOLVED ORGANIC	21	POTASSIUM DISSOLVED
7	CHLORIDE DISSOLVED	22	RESIDUE FIXED NONFILTRABLE
8	COLIFORMS TOTAL	23	RESIDUE NONFILTRABLE
9	CONDUCTANCE (FIELD)	24	RESIDUE VOLATILE NONFILTRABLE
10	FECAL STREPTOCOCCI	25	SODIUM DISSOLVED
11	HARDNESS TOTAL CACO3	26	SPECIFIC CONDUCTANCE
12	IRON TOTAL	27	SULPHATE
13	MAGNESIUM DISSOLVED	28	TEMPERATURE WATER
14	MANGANESE TOTAL	29	TOTAL DISSOLVED SOLIDS
15	NITROGEN DISSOLVED NO3 & NO2	30	pH

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
SODIUM DISSOLVED	CHLORIDE DISSOLVED	0.9782	60	0.1466	3.681
CHLORIDE DISSOLVED	SPECIFIC CONDUCTANCE	0.9437	64	0.1444	3.682
SPECIFIC CONDUCTANCE	CHLORIDE DISSOLVED	0.9437	64	0.1444	3.683
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.992	57	0.1497	3.683
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.992	57	0.1497	3.688
POTASSIUM DISSOLVED	SODIUM DISSOLVED	0.9456	60	0.1519	3.688
MAGNESIUM DISSOLVED	HARDNESS TOTAL CACO3	0.8738	59	0.1657	3.705
OXYGEN BIOCHEMICAL DEMAND	CHLORIDE DISSOLVED	0.9046	55	0.1715	3.709
HARDNESS TOTAL CACO3	MAGNESIUM DISSOLVED	0.8738	59	0.1657	3.710
CALCIUM HARDNESS	CALCIUM DISSOLVED	0.9978	42	0.1832	3.713
BICARBONATE	ALKALINITY TOTAL CACO3	0.8679	56	0.1754	3.714
ALKALINITY TOTAL CACO3	BICARBONATE	0.8679	56	0.1754	3.720
CALCIUM DISSOLVED	CALCIUM HARDNESS	0.9978	42	0.1832	3.726

Sampling site: SK05NB0198 (SASK_30)



Code	Water quality variables
1	ALKALINITY TOTAL CACO3
2	BICARBONATE
3	CALCIUM DISSOLVED
4	CARBON DISSOLVED ORGANIC
5	CHLORIDE DISSOLVED
6	CHLOROPHYLL A
7	COLIFORMS TOTAL
8	CONDUCTANCE
9	FECAL STREPTOCOCCI
10	HARDNESS TOTAL CACO3
11	MAGNESIUM DISSOLVED
12	NITROGEN TOTAL KJELDAHL
13	OXYGEN BIOCHEMICAL DEMAND
14	OXYGEN TOTAL COD
15	pH
16	PHOSPHOROUS DISSOLVED ORTHO
17	PHOSPHOROUS TOTAL
18	POTASSIUM DISSOLVED
19	RESIDUE FIXED NONFILTRABLE
20	RESIDUE NONFILTRABLE
21	SODIUM DISSOLVED
22	SPECIFIC CONDUCTANCE
23	SULPHATE DISSOLVED
24	TEMPERATURE WATER
25	TURBIDITY

Discontinued Variable	Best-auxiliary	*r*	n_1	*var(u)*	I_a
CALCIUM DISSOLVED	HARDNESS TOTAL CACO3	0.9399	31	0.1906	3.800
HARDNESS TOTAL CACO3	CALCIUM DISSOLVED	0.9399	31	0.1906	3.800
SODIUM DISSOLVED	SPECIFIC CONDUCTANCE	0.9418	31	0.1914	3.801
TURBIDITY	RESIDUE FIXED NONFILTRABLE	0.8404	28	0.2017	3.805
RESIDUE FIXED NONFILTRABLE	RESIDUE NONFILTRABLE	0.9981	41	0.186	3.814
RESIDUE NONFILTRABLE	RESIDUE FIXED NONFILTRABLE	0.9981	41	0.186	3.814
SULPHATE DISSOLVED	SODIUM DISSOLVED	0.9015	28	0.2122	3.816
SPECIFIC CONDUCTANCE	SODIUM DISSOLVED	0.9418	31	0.1914	3.820
BICARBONATE	ALKALINITY TOTAL CACO3	0.9937	29	0.2247	3.832
ALKALINITY TOTAL CACO3	BICARBONATE	0.9937	29	0.2247	3.856
PHOSPHOROUS DISSOLVED ORTHO	PHOSPHOROUS TOTAL	0.9485	40	0.2327	3.863
PHOSPHOROUS TOTAL	PHOSPHOROUS DISSOLVED ORTHO	0.9485	40	0.2327	3.865

APPENDIX H: SAMPLING FREQUENCY ASSESSMENT RESULTS

Sampling site: SK05HF0206 (SASK_9) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3[4]	60	37	24	MAGNESIUM TOTAL [1]	10	< 10	< 10
ALKALINITY TOTAL CACO3 [2]	15	< 10	< 10	MANGANESE TOTAL [4]	> 60	48	30
ALUMINUM TOTAL [4]	> 60	> 60	42	NICKEL TOTAL [4]	> 60	50	30
ARSENIC TOTAL [3]	30	17	12	NITROGEN DISSOLVED NO3 & NO2 [4]	> 60	45	23
BARIUM TOTAL [2]	15	< 10	< 10	NITROGEN TOTAL AMMONIA [4]	> 60	> 60	34
BICARBONATE [2]	11	< 10	< 10	NITROGEN TOTAL KJELDAHL [4]	55	35	22
BORON TOTAL [4]	>60	43	27	OXYGEN BIOCHEMICAL DEMAND [4]	60	35	22
CALCIUM DISSOLVED [1]	10	< 10	< 10	OXYGEN DISSOLVED (FIELD) [2]	16	< 10	< 10
CALCIUM HARDNESS [1]	10	< 10	< 10	OXYGEN DISSOLVED [2]	20	12	< 10
CALCIUM TOTAL [1]	10	< 10	< 10	PHOSPHOROUS DISSOLVED ORTHO [4]	> 60	55	34
CARBON DISSOLVED ORGANIC [2]	25	15	< 10	PHOSPHOROUS TOTAL [4]	> 60	57	35
CARBON TOTAL [3]	50	30	18	POTASSIUM DISSOLVED [2]	25	14	< 10
CARBON TOTAL INORGANIC [2]	20	10	< 10	POTASSIUM TOTAL [3]	40	21	7
CARBON TOTAL ORGANIC [4]	> 60	45	28	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	41
CARBONATE [4]	> 60	45	27	RESIDUE NONFILTRABLE (TSS) [4]	> 60	60	38
CHLORIDE DISSOLVED [4]	50	32	20	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	60	35	22
CHLOROPHYLL A [4]	> 60	50	32	SILICON TOTAL [4]	> 60	42	26
CHROMIUM TOTAL [4]	> 60	44	27	SODIUM DISSOLVED [2]	20	10	< 10
COLIFORMS FECAL [4]	> 60	> 60	52	SODIUM TOTAL [2]	21	8	< 10
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SPECIFIC CONDUCTANCE [2]	16	10	< 10
CONDUCTANCE (FIELD) [2]	15	< 10	< 10	SULPHATE [2]	15	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
COPPER TOTAL [4]	> 60	> 60	50	SULPHATE DISSOLVED [2]	12	< 10	< 10
CYANIDE TOTAL [4]	> 60	60	37	TEMPERATURE WATER [4]	> 60	50	32
FECAL STREPTOCOCCI [4]	> 60	> 60	50	TITANIUM TOTAL [4]	> 60	60	40
FLUORIDE DISSOLVED [2]	14	< 10	< 10	TOTAL DISSOLVED SOLIDS [1]	< 10	< 10	< 10
HARDNESS TOTAL CACO3 [1]	< 10	< 10	< 10	TURBIDITY [4]	60	30	20
IRON TOTAL [4]	> 60	60	40	pH [1]	< 10	< 10	< 10
MAGNESIUM DISSOLVED [1]	10	< 10	< 10				

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05HG0283 (SASK_10) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples		
	6	12	26
ALKALINITY TOTAL CACO3 [1]	< 10	< 10	< 10
BICARBONATE (CALCD.) [1]	< 10	< 10	< 10
CALCIUM DISSOLVED [1]	< 10	< 10	< 10
CARBON DISSOLVED ORGANIC [2]	40	22	14
CHLORIDE DISSOLVED [2]	22	14	< 10
FECAL STREPTOCOCCI [4]	> 60	> 60	54
HARDNESS TOTAL CACO3 [1]	< 10	< 10	< 10
MAGNESIUM DISSOLVED [1]	< 10	< 10	< 10
NITROGEN DISSOLVED NITRATE [3]	30	18	12
NITROGEN TOTAL KJELDAHL [3]	60	44	27
OXYGEN DISSOLVED (FIELD) [2]	50	28	17
PHOSPHOROUS TOTAL [3]	> 60	60	42
RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	44	27
RESIDUE NONFILTRABLE (TSS) [4]	60	37	24
SODIUM DISSOLVED [1]	10	<10	<10
SULPHATE DISSOLVED [1]	11	<10	<10
TEMPERATURE WATER [4]	> 60	55	35
TURBIDITY [4]	60	43	24
pH [1]	< 10	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year;
[3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05FF0020 (SASK_11) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples		
	6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	55	35	27
ALKALINITY TOTAL CACO3 [2]	25	16	10
BICARBONATE [3]	30	18	11
CALCIUM DISSOLVED [3]	40	24	15
CARBON DISSOLVED ORGANIC [2]	15	10	< 10
CARBONATE [4]	60	35	22
CHLORIDE DISSOLVED [3]	35	21	14
HARDNESS TOTAL CACO3 [3]	30	18	12
MAGNESIUM DISSOLVED [3]	30	18	12
NITROGEN TOTAL KJELDAHL [3]	50	27	17
OXYGEN DISSOLVED (FIELD) [3]	40	25	16
OXYGEN TOTAL COD [3]	40	23	16
PHOSPHOROUS TOTAL [4]	> 60	45	28
POTASSIUM DISSOLVED [2]	20	12	< 10
RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	49
RESIDUE NONFILTRABLE (TSS) [4]	> 60	> 60	45
SODIUM DISSOLVED [3]	35	20	13
SULPHATE DISSOLVED [3]	30	18	12
TEMPERATURE WATER (FIELD) [4]	> 60	45	28
TURBIDITY [4]	> 60	55	30
pH [1]	< 10	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK06AG0022 (SASK_12) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [2]	22	13	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	> 60	40	25
BARIUM TOTAL [2]	17	10	<10	OXYGEN DISSOLVED (FIELD) [3]	30	17	12
BICARBONATE [2]	17	10	< 10	OXYGEN TOTAL COD [2]	25	15	10
BORON TOTAL [3]	45	28	17	PH (FIELD) [1]	10	< 10	< 10
CALCIUM DISSOLVED [2]	22	13	< 10	PHOSPHOROUS DISSOLVED ORTHO [3]	35	20	14
CARBON DISSOLVED ORGANIC [2]	20	13	< 10	PHOSPHOROUS TOTAL [3]	35	20	14
CHLORIDE DISSOLVED [3]	40	22	13	POTASSIUM DISSOLVED [2]	25	15	< 10
CHLOROPHYLL A [4]	> 60	48	30	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	>60	40
COLIFORMS TOTAL [4]	> 60	60	35	RESIDUE NONFILTRABLE (TSS) [4]	> 60	48	30
CONDUCTANCE [2]	25	14	< 10	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	60	43	24
FLUORIDE DISSOLVED [2]	21	12	< 10	SODIUM DISSOLVED [2]	25	14	< 10
HARDNESS TOTAL CACO3 [2]	20	12	< 10	SPECIFIC CONDUCTANCE [2]	19	12	< 10
IRON TOTAL [3]	35	22	12	SULPHATE DISSOLVED [3]	35	21	13
MAGNESIUM DISSOLVED [2]	20	12	< 10	TEMPERATURE WATER [4]	> 60	55	35
MANGANESE TOTAL [4]	60	38	23	TOTAL DISSOLVED SOLIDS [2]	20	12	< 10
NITROGEN DISSOLVED NO3 & NO2 [4]	> 60	50	32	TURBIDITY (FIELD) [4]	> 60	50	32
NITROGEN TOTAL [2]	20	13	< 10	TURBIDITY [4]	> 60	40	25
NITROGEN TOTAL AMMONIA [4]	> 60	50	32	pH [1]	< 10	< 10	< 10
NITROGEN TOTAL KJELDAHL [3]	30	18	12				

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK06CD0027 (SASK_13) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [2]	16	< 10	< 10	NITROGEN TOTAL [2]	15	10	< 10
BICARBONATE [2]	15	< 10	< 10	NITROGEN TOTAL KJELDAHL [3]	35	20	13
CALCIUM DISSOLVED [2]	15	< 10	< 10	OXYGEN TOTAL COD [2]	18	10	< 10
CARBON DISSOLVED INORGANIC [2]	20	10	< 10	PH (FIELD) [1]	< 10	< 10	< 10
CARBON DISSOLVED ORGANIC [2]	20	12	< 10	PHOSPHOROUS PARTICULATE [4]	50	32	20
CARBON PARTICULATE ORGANIC [3]	45	25	16	PHOSPHOROUS TOTAL [3]	45	27	17
CHLORIDE DISSOLVED [2]	20	12	< 10	PHOSPHOROUS TOTAL DISSOLVED [3]	35	19	13
CHLOROPHYLL A [4]	> 60	40	27	POTASSIUM DISSOLVED [2]	25	15	< 10
CONDUCTANCE (FIELD) [2]	17	11	< 10	RESIDUE NONFILTRABLE (TSS) [4]	55	33	20
FLUORIDE DISSOLVED [2]	19	12	< 10	SILICA REACTIVE [3]	40	25	16
HARDNESS TOTAL CACO3 [2]	14	< 10	< 10	SODIUM DISSOLVED [2]	15	< 10	< 10
IRON EXTRACTABLE [3]	32	18	13	SPECIFIC CONDUCTANCE [2]	13	< 10	< 10
MAGNESIUM DISSOLVED [2]	15	< 10	< 10	SULPHATE DISSOLVED [2]	25	14	< 10
MANGANESE EXTRACTABLE [4]	45	30	18	TEMPERATURE WATER [4]	> 60	40	25
NITROGEN DISSOLVED [2]	20	12	< 10	TURBIDITY [3]	50	29	18
NITROGEN PARTICULATE [3]	45	26	18	Ph [1]	< 10	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05GD0076 (SASK_14) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples		
	6	12	26
ALKALINITY TOTAL CACO3 [1]	< 10	< 10	< 10
BICARBONAT [1]	12	< 10	< 10
CALCIUM DISSOLVED [1]	12	< 10	< 10
CARBON DISSOLVED ORGANIC [3]	45	25	16
CARBONATE [4]	> 60	60	38
CHLORIDE DISSOLVED [3]	35	22	14
CONDUCTANCE [2]	16	< 10	< 10
HARDNESS TOTAL CACO3 [1]	11	< 10	< 10
MAGNESIUM DISSOLVED [1]	10	< 10	< 10
NITROGEN TOTAL KJELDAHL [4]	> 60	45	30
OXYGEN DISSOLVED (FIELD) [2]	25	12	< 10
PH (FIELD) [1]	< 10	< 10	< 10
PHOSPHOROUS TOTAL [4]	> 60	45	27
POTASSIUM DISSOLVED [3]	45	28	17
RESIDUE FIXED NONFILTRABL (FSS) [4]	> 60	> 60	42
RESIDUE NONFILTRABL (TSS) [4]	> 60	> 60	47
SODIUM DISSOLVED [2]	25	15	< 10
SULPHAT DISSOLVED [2]	15	< 10	< 10
TEMPERATURE WATER [4]	> 60	50	34
TURBIDITY [4]	> 60	> 60	42
pH [1]	< 10	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05GG0102 (SASK_15) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [2]	15	< 10	< 10	MANGANESE TOTAL [4]	> 60	44	28
ALUMINUM TOTAL [4]	> 60	> 60	55	NITROGEN DISSOLVED NO3 & NO2 [4]	> 60	45	28
BARIUM TOTAL [3]	45	26	18	NITROGEN TOTAL AMMONIA [4]	> 60	> 60	45
BICARBONATE [2]	15	< 10	< 10	NITROGEN TOTAL KJELDAHL [4]	60	40	25
CALCIUM DISSOLVED [2]	16	< 10	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	55	32	20
CALCIUM HARDNESS [2]	20	13	< 10	OXYGEN DISSOLVED [3]	30	15	< 10
CALCIUM TOTAL [1]	12	< 10	< 10	OXYGEN TOTAL COD [3]	45	28	17
CARBON DISSOLVED ORGANIC [3]	45	28	18	PHOSPHOROUS DISSOLVED ORTHO [4]	60	42	24
CARBON TOTAL [2]	20	13	< 10	PHOSPHORUS TOTAL [4]	> 60	44	28
CARBON TOTAL INORGANIC [2]	25	14	< 10	POTASSIUM DISSOLVED [4]	55	32	19
CARBON TOTAL ORGANIC [3]	45	25	16	POTASSIUM TOTAL [4]	55	32	18
CARBONATE [4]	> 60	55	35	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	48
CHLORIDE DISSOLVED [4]	> 60	45	28	RESIDUE NONFILTRABLE (TSS) [4]	> 60	> 60	45
CHLOROPHYLL A [4]	> 60	50	34	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	60	40	27
COLIFORMS FECAL [4]	> 60	> 60	> 60	RESIN ACID SOAPS [4]	> 60	45	29
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SODIUM DISSOLVED [3]	45	25	16
CONDUCTANCE (FIELD) [2]	25	14	< 10	SODIUM TOTAL [3]	32	18	12
COPPER TOTAL [4]	> 60	60	40	SPECIFIC CONDUCTANCE [2]	20	12	< 10
FECAL STREPTOCOCCI [4]	> 60	> 60	42	SULPHATE [2]	25	14	< 10
FLUORIDE DISSOLVED [2]	13	< 10	< 10	SULPHATE DISSOLVED [2]	25	15	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
HARDNESS TOTAL CACO3 [2]	15	< 10	< 10	SULPHIDE DISSOLVED [4]	> 60	> 60	44
IRON TOTAL [4]	> 60	> 60	49	TEMPERATURE WATER [4]	> 60	52	34
MAGNESIUM DISSOLVED [2]	22	13	< 10	TOTAL DISSOLVED SOLIDS [2]	15	10	< 10
MAGNESIUM HARDNESS [3]	30	17	12	TURBIDITY [4]	> 60	> 60	52
MAGNESIUM TOTAL [2]	19	10	< 10	pH [1]	< 10	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05GG0022 (SASK_16) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	> 60	45	27	MAGNESIUM DISSOLVED [2]	15	< 10	< 10
ALKALINITY TOTAL CACO3 [2]	15	< 10	< 10	MAGNESIUM TOTAL [2]	15	< 10	< 10
ALUMINUM TOTAL [4]	> 60	> 60	60	MANGANESE TOTAL [4]	> 60	60	36
ARSENIC TOTAL [4]	60	43	27	NICKEL TOTAL [4]	> 60	46	30
BARIUM TOTAL [3]	45	25	17	NITROGEN DISSOLVED NO3 & NO2 [4]	60	44	27
BERYLLIUM TOTAL [1]	< 10	< 10	< 10	NITROGEN TOTAL AMMONIA [4]	> 60	> 60	42
BICARBONATE [2]	16	< 10	< 10	NITROGEN TOTAL KJELDAHL [4]	60	37	24
BORON TOTAL [3]	45	26	18	OXYGEN BIOCHEMICAL DEMAND [4]	60	40	25
CALCIUM DISSOLVED [2]	16	< 10	< 10	OXYGEN DISSOLVED (FIELD) [2]	20	12	< 10
CALCIUM HARDNESS [2]	20	12	< 10	OXYGEN DISSOLVED [3]	30	17	12
CALCIUM TOTAL [1]	10	< 10	< 10	OXYGEN TOTAL COD [3]	50	30	18
CARBON DISSOLVED ORGANIC [4]	50	30	17	PHOSPHOROUS DISSOLVED ORTHO [4]	60	42	27
CARBON TOTAL [2]	20	10	< 10	PHOSPHOROUS TOTAL [4]	> 60	45	28
CARBON TOTAL INORGANIC [2]	27	15	< 10	POTASSIUM DISSOLVED [4]	50	28	18
CARBON TOTAL ORGANIC [4]	60	40	27	POTASSIUM TOTAL [3]	35	20	12
CARBONATE [4]	> 60	53	33	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	50
CHLORIDE DISSOLVED [4]	60	40	25	RESIDUE NONFILTRABLE (TSS) [4]	> 60	> 60	48
CHLOROPHYLL A [4]	> 60	55	35	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	56	36
COLIFORMS FECAL [4]	> 60	> 60	> 60	SODIUM DISSOLVED [3]	40	24	15
COLIFORMS TOTAL [4]	> 60	> 60	55	SODIUM TOTAL [3]	35	20	12
COLIFORMS TOTAL [4]	> 60	> 60	45	SPECIFIC CONDUCTANCE [2]	20	10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
COLOUR APPARENT [4]	55	34	22	SULPHATE [2]	25	14	< 10
CONDUCTANCE (FIELD) [3]	35	20	12	SULPHATE DISSOLVED [3]	30	18	13
COPPER TOTAL [4]	> 60	45	28	TEMPERATURE WATER [4]	> 60	50	44
FECAL STREPTOCOCCI [4]	> 60	> 60	50	TITANIUM TOTAL [4]	> 60	> 60	55
FLUORIDE DISSOLVED [2]	14	10	< 10	TOTAL DISSOLVED SOLIDS [2]	16	10	< 10
HARDNESS TOTAL CACO3 [2]	15	< 10	< 10	TURBIDITY [4]	> 60	> 60	52
IRON TOTAL [4]	> 60	> 60	55	pH [1]	< 10	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05EG0090 (SASK_17) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [2]	12	< 10	< 10	NITROGEN TOTAL AMMONIA [4]	> 60	> 60	41
BICARBONATE [2]	14	< 10	< 10	NITROGEN TOTAL KJELDAHL [4]	50	32	20
CALCIUM DISSOLVED [2]	15	< 10	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	> 60	45	28
CALCIUM HARDNESS [2]	16	< 10	< 10	PHOSPHOROUS DISSOLVED ORTHO [4]	60	40	26
CARBON DISSOLVED ORGANIC [3]	45	27	18	PHOSPHOROUS TOTAL [4]	60	42	28
CARBONATE [4]	> 60	48	30	POTASSIUM DISSOLVED [3]	45	25	16
CHLORIDE DISSOLVED [4]	60	47	28	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	45
CHLOROPHYLL A [4]	> 60	> 60	44	RESIDUE NONFILTRABLE (TSS) [4]	> 60	> 60	44
COLIFORMS FECAL [4]	> 60	> 60	48	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	56	37
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SODIUM DISSOLVED [3]	35	21	12
CONDUCTANCE (FIELD) [3]	30	18	12	SPECIFIC CONDUCTANCE [2]	15	10	< 10
FECAL STREPTOCOCCI [4]	> 60	> 60	50	SULPHATE [2]	20	12	< 10
HARDNESS TOTAL CACO3 [2]	15	< 10	< 10	TEMPERATURE WATER [4]	> 60	55	35
MAGNESIUM DISSOLVED [2]	15	< 10	< 10	TOTAL DISSOLVED SOLIDS [2]	14	< 10	< 10
NITROGEN DISSOLVED NO3 & NO2 [4]	60	43	27	pH [1]	< 10	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05JG0126 (SASK_18) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [2]	25	14	< 10	NICKEL TOTAL [4]	60	44	22
ALUMINUM TOTAL [4]	> 60	> 60	48	NITROGEN DISSOLVED NO3 & NO2 [4]	> 60	> 60	47
ARSENIC TOTAL [4]	60	38	24	NITROGEN TOTAL AMMONIA [4]	> 60	60	38
BARIUM TOTAL [3]	30	18	12	NITROGEN TOTAL KJELDAHL [4]	55	30	18
BICARBONATE [2]	25	16	10	OXYGEN BIOCHEMICAL DEMAND [4]	60	36	23
CALCIUM DISSOLVED [2]	25	16	< 10	OXYGEN DISSOLVED [3]	30	20	12
CALCIUM HARDNESS [2]	25	16	< 10	OXYGEN DISSOLVED (FIELD) [2]	25	14	< 10
CALCIUM TOTAL [2]	25	16	< 11	pH [1]	< 10	< 10	< 10
CARBON DISSOLVED ORGANIC [3]	35	22	13	pH (FIELD) [1]	< 10	< 10	< 10
CARBON TOTAL [2]	22	13	< 10	PHOSPHOROUS DISSOLVED ORTHO [4]	> 60	52	43
CARBON TOTAL INORGANIC [3]	30	18	13	PHOSPHOROUS TOTAL [4]	> 60	45	28
CARBON TOTAL ORGANIC [4]	55	34	20	POTASSIUM DISSOLVED [3]	30	20	13
CARBONATE [4]	> 60	> 60	41	POTASSIUM TOTAL [3]	48	28	18
CHLORIDE DISSOLVED [3]	45	27	17	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	39
CHLOROPHYLL A [4]	> 60	50	32	RESIDUE NONFILTRABLE (TSS) [4]	> 60	55	35
COLIFORMS FECAL [4]	> 60	> 60	56	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	44	27
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SODIUM DISSOLVED [2]	27	16	20
CONDUCTANCE (FIELD) [2]	25	14	< 10	SODIUM TOTAL [3]	30	18	12
FECAL STREPTOCOCCI [4]	> 60	> 60	> 60	SPECIFIC CONDUCTANCE [2]	20	13	< 10
HARDNESS TOTAL CACO3 [2]	20	12	< 10	SULPHATE [2]	22	13	< 10
IRON TOTAL [4]	> 60	> 60	48	TEMPERATURE WATER [4]	> 60	55	35
MAGNESIUM DISSOLVED [2]	20	12	< 10	TITANIUM TOTAL [4]	> 60	> 60	52
MAGNESIUM TOTAL [2]	22	13	< 10	TOTAL DISSOLVED SOLIDS [2]	20	12	< 10
MANGANESE TOTAL [4]	> 60	45	28	TURBIDITY [4]	> 60	50	32

Sampling site: SK05HH0267 (SASK_19) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [1]	< 10	< 10	< 10	MERCURY TOTAL [4]	> 60	> 60	> 60
BARIUM TOTAL [1]	< 10	< 10	< 10	NITROGEN DISSOLVED NITRATE [3]	30	18	12
BICARBONATE [1]	< 10	< 10	< 10	NITROGEN DISSOLVED NO3 & NO2 [4]	55	43	23
CALCIUM DISSOLVED [1]	< 10	< 10	< 10	NITROGEN TOTAL AMMONIA [4]	> 60	48	30
CALCIUM HARDNESS [1]	< 10	< 10	< 10	NITROGEN TOTAL KJELDAHL [4]	55	32	21
CARBON DISSOLVED ORGANIC [2]	25	13	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	50	30	20
CARBON TOTAL [2]	14	< 10	< 10	OXYGEN DISSOLVED [2]	25	14	< 10
CARBON TOTAL INORGANIC [2]	15	< 10	< 10	OXYGEN TOTAL COD [3]	40	22	14
CARBON TOTAL ORGANIC [4]	60	43	27	pH (FIELD) [1]	< 10	< 10	< 10
CARBONATE [4]	> 60	45	28	PHOSPHOROUS DISSOLVED ORTHO [4]	60	42	25
CHLORIDE DISSOLVED [3]	45	28	18	PHOSPHOROUS TOTAL [4]	60	42	25
CHLOROPHYLL A [4]	> 60	43	28	POTASSIUM DISSOLVED [2]	25	14	< 10
CHROMIUM TOTAL [4]	60	43	27	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	60	40
COLIFORMS FECAL [4]	> 60	> 60	> 60	RESIDUE NONFILTRABLE (TSS) [4]	> 60	55	44
COLIFORMS TOTAL [4]	> 60	> 60	> 60	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	55	35	23
CONDUCTANCE (FIELD) [2]	20	10	< 10	SODIUM DISSOLVED [2]	20	10	< 10
FECAL STREPTOCOCCI [4]	> 60	> 60	50	SPECIFIC CONDUCTANCE [2]	14	< 10	< 10
FLUORIDE DISSOLVED [1]	10	< 10	< 10	SULPHATE [2]	18	10	< 10
HARDNESS TOTAL CACO3 [1]	< 10	< 10	< 10	SULPHATE DISSOLVED [2]	15	< 10	< 10
IRON TOTAL [4]	> 60	> 60	41	TEMPERATURE WATER [4]	> 60	56	36
MAGNESIUM DISSOLVED [2]	12	< 10	< 10	TOTAL DISSOLVED SOLIDS [1]	< 10	< 10	< 10
MAGNESIUM HARDNESS [2]	20	12	< 10	TURBIDITY [4]	> 60	45	28
MANGANESE TOTAL [4]	55	44	23	pH [1]	< 10	< 10	< 10

Sampling site: SK05HF0205 (SASK_20) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	60	37	23	MANGANESE TOTAL [4]	> 60	55	34
ALKALINITY TOTAL CACO3 [1]	< 10	< 10	< 10	NICKEL TOTAL [4]	> 60	55	35
ALUMINUM TOTAL [4]	> 60	> 60	50	NITROGEN DISSOLVED NO3 & NO2 [4]	55	34	22
ARSENIC TOTAL [3]	35	20	13	NITROGEN TOTAL AMMONIA [4]	60	40	26
BARIUM TOTAL [2]	15	< 10	< 10	NITROGEN TOTAL KJELDAHL [4]	50	32	20
BICARBONATE [1]	< 10	< 10	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	50	30	18
BORON TOTAL [4]	60	37	23	OXYGEN DISSOLVED (FIELD) [2]	15	< 10	< 10
CALCIUM DISSOLVED [1]	10	< 10	< 10	OXYGEN DISSOLVED [2]	20	12	< 10
CALCIUM HARDNESS [2]	12	< 10	< 10	PHOSPHOROUS DISSOLVED ORTHO [4]	55	35	22
CALCIUM TOTAL [1]	< 10	< 10	< 10	PHOSPHOROUS TOTAL [4]	60	38	24
CARBON DISSOLVED ORGANIC [2]	25	15	< 10	POTASSIUM DISSOLVED [3]	30	17	11
CARBON TOTAL [1]	10	< 10	< 10	POTASSIUM TOTAL [3]	45	27	17
CARBON TOTAL INORGANIC [2]	15	< 10	< 10	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	58
CARBON TOTAL ORGANIC [4]	> 60	45	29	RESIDUE NONFILTRABLE (TSS) [4]	> 60	> 60	50
CARBONATE [4]	> 60	45	29	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	43	28
CHLORIDE DISSOLVED [3]	45	28	18	SELENIUM TOTAL [4]	> 60	60	40
CHLOROPHYLL A [4]	60	38	25	SILICON TOTAL [4]	60	38	25
CHROMIUM TOTAL [4]	> 60	45	29	SODIUM DISSOLVED [2]	15	< 10	< 10
COLIFORMS FECAL [4]	> 60	> 60	> 60	SODIUM TOTAL [2]	20	12	< 10
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SPECIFIC CONDUCTANCE [1]	< 10	< 10	< 10
CONDUCTANCE (FIELD) [2]	15	< 10	< 10	SULPHATE [2]	20	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
COPPER TOTAL [4]	> 60	> 60	45	SULPHATE DISSOLVED [2]	16	< 10	< 10
CYANIDE TOTAL [4]	> 60	> 60	45	TEMPERATURE WATER [4]	> 60	50	32
FECAL STREPTOCOCCI [4]	> 60	> 60	> 60	TITANIUM TOTAL [4]	> 60	> 60	48
HARDNESS TOTAL CACO3 [1]	< 10	< 10	< 10	TOTAL DISSOLVED SOLIDS [1]	< 10	< 10	< 10
IRON TOTAL [4]	> 60	> 60	42	TURBIDITY [4]	> 60	> 60	48
MAGNESIUM DISSOLVED [2]	20	10	< 10	ZINC TOTAL [4]	> 60	> 60	50
MAGNESIUM HARDNESS [2]	25	14	< 10	pH [1]	< 10	< 10	< 10
MAGNESIUM TOTAL [1]	< 10	< 10	< 10				

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05KD0154 (SASK_21) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	60	45	27	MANGANESE TOTAL [4]	60	38	24
ALKALINITY TOTAL CACO3 [1]	11	< 10	< 10	NICKEL TOTAL [4]	> 60	50	32
ALUMINUM TOTAL [4]	> 60	> 60	44	NITROGEN DISSOLVED NO3 & NO2 [4]	60	38	24
ARSENIC TOTAL [4]	60	33	21	NITROGEN TOTAL AMMONIA [4]	> 60	> 60	45
BARIUM TOTAL [2]	20	12	< 10	NITROGEN TOTAL KJELDAHL [4]	60	40	25
BICARBONATE [2]	13	< 10	< 10	OIL AND GREASE [4]	> 60	> 60	46
CALCIUM DISSOLVED [2]	12	< 10	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	60	35	22
CARBON DISSOLVED ORGANIC [3]	32	18	12	OXYGEN DISSOLVED [3]	30	15	< 10
CARBON TOTAL [2]	15	< 10	< 10	OXYGEN DISSOLVED (FIELD) [2]	15	< 10	< 10
CARBON TOTAL INORGANIC [2]	19	11	< 10	pH [1]	< 10	< 10	< 10
CARBON TOTAL ORGANIC [4]	60	40	26	PHOSPHOROUS DISSOLVED ORTHO [4]	60	42	28
CARBONATE [4]	> 60	55	36	PHOSPHOROUS TOTAL [4]	> 60	48	29
CHLORIDE DISSOLVED [3]	45	25	17	POTASSIUM DISSOLVED [3]	42	24	16
CHLOROPHYLL A [4]	> 60	57	37	POTASSIUM TOTAL [3]	35	22	14
CHROMIUM TOTAL [4]	> 60	45	28	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	55
COLIFORMS FECAL [4]	> 60	> 60	47	RESIDUE NONFILTRABLE (TSS) [4]	> 60	> 60	55
COLIFORMS TOTAL [4]	> 60	> 60	46	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	> 60	45
CONDUCTANCE (FIELD) [2]	23	13	< 10	SODIUM DISSOLVED [2]	20	12	< 10
COPPER TOTAL [4]	> 60	55	35	SODIUM TOTAL [2]	22	14	< 10
FECAL STREPTOCOCCI [4]	> 60	> 60	46	SPECIFIC CONDUCTANCE [2]	15	< 10	< 10
HARDNESS TOTAL CACO3 [1]	10	< 10	< 10	SULPHATE [2]	22	13	< 10
IRON TOTAL [4]	> 60	60	40	SULPHATE DISSOLVED [2]	17	< 10	< 10
MAGNESIUM DISSOLVED [2]	12	< 10	< 10	TEMPERATURE WATER [4]	> 60	60	38
MAGNESIUM TOTAL [2]	15	< 10	< 10	ZINC TOTAL [4]	> 60	> 60	46

Sampling site: SK05KD0089 (SASK_22) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	> 60	55	35	NITROGEN TOTAL AMMONIA [4]	> 60	45	28
ALKALINITY TOTAL CACO3 [1]	10	< 10	< 10	NITROGEN TOTAL KJELDAHL [3]	45	28	18
ALUMINUM TOTAL [4]	> 60	60	37	OXYGEN BIOCHEMICAL DEMAND [4]	60	33	22
ARSENIC TOTAL [3]	45	27	18	OXYGEN DISSOLVED (FIELD) [2]	20	13	< 10
BARIUM TOTAL [2]	13	< 10	< 10	OXYGEN TOTAL COD [2]	27	17	10
BICARBONATE [2]	12	< 10	< 10	pH [1]	< 10	< 10	< 10
BORON TOTAL [2]	25	14	< 10	PHOSPHOROUS DISSOLVED ORTHO [4]	60	37	23
CALCIUM DISSOLVED [2]	12	< 10	< 10	PHOSPHOROUS TOTAL [4]	60	33	22
CALCIUM HARDNESS [2]	12	< 10	< 10	POTASSIUM DISSOLVED [2]	27	15	< 10
CALCIUM TOTAL [2]	13	< 10	< 10	POTASSIUM TOTAL [3]	35	22	14
CARBON DISSOLVED ORGANIC [2]	27	15	< 10	RESIDUE FIXED NONFILTRABLE (FSS) [4]	60	42	27
CARBONATE [4]	> 60	55	35	RESIDUE NONFILTRABLE (TSS) [4]	60	37	24
CHLORIDE DISSOLVED [3]	35	20	13	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	50	28	18
CHLOROPHYLL A [4]	> 60	45	28	SILICON TOTAL [4]	60	48	24
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SODIUM DISSOLVED [2]	15	< 10	< 10
CONDUCTANCE (FIELD) [4]	50	32	20	SODIUM TOTAL [2]	20	12	< 10
COPPER TOTAL [4]	> 60	60	38	SPECIFIC CONDUCTANCE [1]	10	< 10	< 10
FLUORIDE DISSOLVED [2]	12	< 10	< 10	STRONTIUM TOTAL [1]	< 10	< 10	< 10
HARDNESS TOTAL CACO3 [1]	10	< 10	< 10	SULPHATE [2]	15	< 10	< 10
IRON TOTAL [4]	60	43	27	SULPHATE DISSOLVED [2]	13	< 10	< 10
MAGNESIUM DISSOLVED [2]	12	< 10	< 10	TEMPERATURE WATER [4]	> 60	48	31
MAGNESIUM TOTAL [2]	15	< 10	< 10	TOTAL DISSOLVED SOLIDS [2]	12	< 10	< 10
MANGANESE TOTAL [3]	45	28	18	TURBIDITY [4]	60	42	25
NITROGEN DISSOLVED NO3 & NO2 [4]	> 60	50	32				

Sampling site: SK05MC0038 (SASK_23) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	> 60	> 60	> 60	OXYGEN BIOCHEMICAL DEMAND [3]	40	24	15
ALKALINITY TOTAL CACO3 [3]	30	15	< 10	OXYGEN TOTAL COD [3]	30	17	11
BICARBONATE [2]	22	13	< 10	pH [1]	< 10	< 10	< 10
CALCIUM DISSOLVED [2]	25	15	< 10	PHOSPHOROUS DISSOLVED ORTHO [4]	55	35	22
CARBON DISSOLVED ORGANIC [2]	22	13	< 10	PHOSPHOROUS TOTAL [4]	55	35	22
CARBONATE [4]	> 60	> 60	55	POTASSIUM DISSOLVED [3]	30	17	11
CHLORIDE DISSOLVED [4]	60	35	23	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	52	33
CHLOROPHYLL A [4]	> 60	50	31	RESIDUE NONFILTRABLE (TSS) [4]	> 60	47	30
COLIFORMS TOTAL [4]	> 60	> 60	55	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	60	35	23
CONDUCTANCE (FIELD) [3]	35	22	14	SODIUM DISSOLVED [3]	40	23	14
FECAL STREPTOCOCCI [4]	> 60	> 60	57	SPECIFIC CONDUCTANCE [2]	25	14	< 10
FLUORIDE DISSOLVED [2]	18	10	< 10	SULPHATE [3]	35	22	12
HARDNESS TOTAL CACO3 [2]	25	14	< 10	SULPHATE DISSOLVED [3]	40	22	14
MAGNESIUM DISSOLVED [3]	35	20	12	TEMPERATURE WATER [4]	> 60	> 60	43
NITROGEN TOTAL AMMONIA [4]	> 60	> 60	55	TOTAL DISSOLVED SOLIDS [2]	25	14	< 10
NITROGEN TOTAL KJELDAHL [4]	60	35	23	TURBIDITY [4]	60	40	26

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05AD0041 (SASK_24) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [3]	40	23	15	NITROGEN TOTAL KJELDAHL [3]	40	22	14
ALUMINUM TOTAL [4]	> 60	60	38	OXYGEN BIOCHEMICAL DEMAND [4]	> 60	55	34
ARSENIC TOTAL [3]	45	25	16	OXYGEN DISSOLVED (FIELD) [3]	45	27	18
BARIUM TOTAL [3]	30	15	< 10	OXYGEN TOTAL COD [2]	20	12	< 10
BICARBONATE [3]	35	22	14	PHOSPHOROUS TOTAL [4]	50	30	18
CALCIUM DISSOLVED [3]	37	22	13	POTASSIUM DISSOLVED [3]	45	28	17
CARBON DISSOLVED ORGANIC [2]	15	< 10	< 10	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	> 60	48
CHLORIDE DISSOLVED [4]	55	30	19	RESIDUE NONFILTRABLE (TSS) [4]	> 60	> 60	40
CHLOROPHYLL A [4]	> 60	53	34	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	45	28
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SILICON TOTAL [4]	> 60	45	28
CONDUCTANCE (FIELD) [3]	45	25	17	SODIUM DISSOLVED [3]	45	28	18
FECAL STREPTOCOCCI [4]	> 60	55	35	SPECIFIC CONDUCTANCE [3]	38	22	14
FLUORIDE DISSOLVED [2]	25	14	< 10	SULPHATE DISSOLVED [3]	50	28	17
HARDNESS TOTAL CACO3 [3]	38	22	14	TEMPERATURE WATER [4]	> 60	60	40
IRON TOTAL [3]	40	23	15	TOTAL DISSOLVED SOLIDS [4]	40	34	15
MAGNESIUM DISSOLVED [3]	40	23	14	TURBIDITY [4]	> 60	58	36
MANGANESE TOTAL [4]	> 60	> 60	> 60	pH [1]	< 10	< 10	< 10
NITROGEN TOTAL AMMONIA [4]	> 60	60	38				

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05GG0023 (SASK_25) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	> 60	47	32	MANGANES TOTAL [4]	> 60	60	40
ALKALINITY TOTAL CACO3 [2]	15	< 10	< 10	NITROGEN DISSOLVED NO3 & NO2 [4]	> 60	48	30
ALUMINUM TOTAL [4]	> 60	> 60	58	NITROGEN TOTAL AMMONIA [4]	> 60	> 60	47
BARIUM TOTAL [3]	45	25	17	NITROGEN TOTAL KJELDAHL [4]	> 60	50	32
BICARBONAT [2]	18	10	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	60	43	28
CALCIUM DISSOLVED [2]	15	< 10	< 10	OXYGEN DISSOLVED (FIEELD) [2]	25	15	< 10
CALCIUM HARDNESS [2]	20	12	< 10	OXYGEN DISSOLVED [3]	30	18	11
CARBON DISSOLVED ORGANIC [3]	50	28	18	OXYGEN TOTAL COD [4]	45	36	17
CARBON TOTAL [2]	13	< 10	< 10	PH (FIELD) [1]	< 10	< 10	< 10
CARBON TOTAL INORGANIC [2]	25	15	, 10	PHOSPHOROUS DISSOLVED ORTHO [4]	> 60	53	32
CARBON TOTAL ORGANIC [4]	55	35	23	PHOSPHOROUS TOTAL [4]	> 60	58	34
CARBONAT [4]	> 60	50	32	POTASSIUM DISSOLVED [4]	50	30	19
CHLORIDE DISSOLVED [4]	60	38	25	RESIDUE FIXED NONFILTRABLE [4]	> 60	> 60	50
CHLOROPHYLL A [4]	> 60	55	35	RESIDUE NONFILTRABLE (TSS) [4]	> 60	> 60	50
COLIFORMS FECAL [4]	> 60	> 60	> 60	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	55	35
COLIFORMS TOTAL [4]	> 60	> 60	60	SODIUM DISSOLVED [3]	35	22	14
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SPECIFIC CONDUCTANC [2]	18	10	< 10
CONDUCTANCE (FIELD) [3]	35	22	14	SULPHAT [2]	25	14	< 10
COPPER TOTAL [4]	> 60	42	28	SULPHATE DISSOLVED [2]	25	14	< 10
FECAL STREPTOCOCCI [4]	> 60	> 60	56	TEMPERATURE WATER [4]	> 60	43	33
FLUORIDE DISSOLVED [1]	11	< 10	< 10	TITANIUM TOTAL [2]	> 60	> 60	55
HARDNESS TOTAL CACO3 [2]	15	< 10	< 10	TOTAL DISSOLVED SOLIDS [2]	15	< 10	< 10
IRON TOTAL [4]	> 60	> 60	58	TURBIDITY [4]	> 60	> 60	53
MAGNESIUM DISSOLVED [2]	18	11	< 10	pH [1]	< 10	< 10	< 10

Sampling site: SK05JL0129 (SASK_26) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	> 60	45	28	OXYGEN BIOCHEMICAL DEMAND [4]	55	33	21
ALKALINITY TOTAL CACO3 [1]	< 10	< 10	< 10	OXYGEN DISSOLVED (FIELD) [4]	50	30	19
BICARBONATE [2]	15	< 10	< 10	OXYGEN TOTAL COD [2]	17	< 10	< 10
CALCIUM DISSOLVED [1]	< 10	< 10	< 10	pH [1]	< 10	< 10	< 10
CARBON DISSOLVED ORGANIC [2]	20	13	< 10	PHOSPHOROUS DISSOLVED ORTHO [3]	45	25	15
CARBONATE [4]	> 60	45	28	PHOSPHOROUS TOTAL [4]	50	30	20
CHLORIDE DISSOLVED [2]	13	< 10	< 10	POTASSIUM DISSOLVED [1]	11	< 10	< 10
CHLOROPHYLL A [4]	> 60	58	36	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	48	30
COLIFORMS TOTAL [4]	> 60	> 60	> 60	RESIDUE NONFILTRABLE (TSS) [4]	> 60	42	26
FECAL STREPTOCOCCI [4]	> 60	> 60	> 60	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	45	28
FLUORIDE DISSOLVED [1]	10	< 10	< 10	SODIUM DISSOLVED [2]	12	< 10	< 10
HARDNESS TOTAL CACO3 [1]	< 10	< 10	< 10	SPECIFIC CONDUCTANCE [2]	12	< 10	< 10
MAGNESIUM DISSOLVED [2]	12	< 10	< 10	SULPHATE DISSOLVED [2]	15	< 10	< 10
NITROGEN TOTAL AMMONIA [4]	> 60	60	40	TEMPERATURE WATER [4]	> 60	50	32
NITROGEN TOTAL KJELDAHL [3]	35	20	12	TURBIDITY [4]	> 60	50	30

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05JF0092 (SASK_27) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	> 60	55	35	NITROGEN TOTAL AMMONIA [4]	> 60	> 60	> 60
ALKALINITY TOTAL CACO3 [3]	30	17	10	NITROGEN TOTAL KJELDAHL [4]	> 60	55	34
BICARBONATE [3]	30	18	12	OXYGEN BIOCHEMICAL DEMAND [4]	60	42	26
CALCIUM DISSOLVED [3]	32	18	12	OXYGEN DISSOLVED [3]	30	19	12
CALCIUM HARDNESS [3]	37	23	13	OXYGEN DISSOLVED (FIELD) [3]	30	15	< 10
CARBON DISSOLVED ORGANIC [3]	35	20	13	OXYGEN TOTAL COD [3]	50	29	18
CARBON TOTAL [3]	30	18	12	pH [1]	< 10	< 10	< 10
CARBON TOTAL INORGANIC [3]	35	21	13	PHOSPHOROUS DISSOLVED ORTHO [4]	> 60	> 60	55
CARBON TOTAL ORGANIC [3]	45	27	17	PHOSPHOROUS TOTAL [4]	> 60	58	38
CARBONATE [4]	> 60	> 60	43	POTASSIUM DISSOLVED [3]	45	27	18
CHLORIDE DISSOLVED [4]	> 60	45	28	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	60	38
CHLOROPHYLL A [4]	> 60	> 60	42	RESIDUE NONFILTRABLE (TSS) [4]	> 60	55	36
COLIFORMS FECAL [4]	> 60	> 60	> 60	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	> 60	48	29
COLIFORMS TOTAL [4]	> 60	> 60	> 60	SODIUM DISSOLVED [4]	50	30	18
CONDUCTANCE (FIELD) [2]	27	21	13	SODIUM TOTAL [3]	45	27	18
ESCHERICHIA COLI [4]	> 60	> 60	> 60	SPECIFIC CONDUCTANCE [3]	40	22	14
FECAL STREPTOCOCCI [4]	> 60	> 60	48	SULPHATE [3]	45	18	18
FLUORIDE DISSOLVED [2]	16	< 10	< 10	SULPHATE DISSOLVED [3]	35	22	13
HARDNESS TOTAL CACO3 [2]	28	16	10	TEMPERATURE AIR [4]	> 60	> 60	> 60
MAGNESIUM DISSOLVED [2]	27	18	11	TEMPERATURE WATER [4]	> 60	55	35
MAGNESIUM TOTAL [3]	35	21	13	TOTAL DISSOLVED SOLIDS [3]	35	20	12
NITROGEN DISSOLVED NO3 & NO2 [4]	> 60	> 60	46	TURBIDITY [4]	> 60	> 60	40

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05HB0087 (SASK_28) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY PHENOLPHTHALEIN CACO3 [4]	> 60	48	30	MAGNESIUM TOTAL [2]	20	13	< 10
ALKALINITY TOTAL CACO3 [3]	17	10	< 10	MANGANESE TOTAL [4]	> 60	> 60	42
ALUMINUM TOTAL [4]	> 60	> 60	> 60	MERCURY TOTAL [4]	> 60	> 60	50
ARSENIC TOTAL [4]	> 60	50	32	NICKEL TOTAL [4]	> 60	48	37
BARIUM TOTAL [3]	45	27	18	NITROGEN DISSOLVED NO3 & NO2 [2]	> 60	48	30
BICARBONATE [2]	18	10	< 10	NITROGEN TOTAL AMMONIA [4]	> 60	> 60	44
BORON TOTAL [4]	60	43	27	NITROGEN TOTAL KJELDAHL [4]	60	40	26
CALCIUM DISSOLVED [2]	22	13	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	> 60	48	30
CALCIUM HARDNESS [2]	27	15	< 10	OXYGEN DISSOLVED (FIELD) [3]	35	22	13
CALCIUM TOTAL [2]	17	10	< 10	OXYGEN DISSOLVED [2]	25	16	10
CARBON DISSOLVED ORGANIC [4]	60	33	22	PHOSPHOROUS DISSOLVED ORTHO [4]	> 60	52	33
CARBON TOTAL [3]	30	17	11	PHOSPHOROUS TOTAL [4]	> 60	52	37
CARBON TOTAL INORGANIC [2]	25	13	< 10	POTASSIUM DISSOLVED [4]	50	30	18
CARBON TOTAL ORGANIC [4]	60	38	24	POTASSIUM TOTAL [4]	60	33	22
CARBONATE [4]	> 60	50	33	RESIDUE FIXED NON RABLE (FSS) [4]	> 60	> 60	56
CHLORIDE DISSOLVED [4]	55	33	22	RESIDUE NON RABLE (TSS) [4]	> 60	> 60	55
CHLOROPHYLL A [4]	> 60	55	36	RESIDUE VOLATILE NON RABLE (VSS) [4]	> 60	> 60	45
CHROMIUM TOTAL [4]	> 60	> 60	40	SILICON TOTAL [4]	> 60	52	32
COBALT TOTAL [4]	> 60	60	40	SODIUM DISSOLVED [3]	35	20	13

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
COLIFORMS FECAL [4]	> 60	> 60	> 60	SODIUM TOTAL [3]	35	19	13
COLIFORMS TOTAL [4]	> 60	> 60	52	SPECIFIC CONDUCTANCE [2]	20	12	< 10
COLIFORMS TOTAL [4]	> 60	> 60	55	SULPHATE [3]	30	18	10
CONDUCTANCE (FIELD) [2]	22	13	< 10	SULPHATE DISSOLVED [2]	25	15	< 10
COPPER TOTAL [4]	> 60	52	33	TEMPERATURE WATER [4]	> 60	55	45
CYANIDE TOTAL [4]	> 60	> 60	42	TITANIUM TOTAL [4]	> 60	> 60	55
FECAL STREPTOCOCCI [4]	> 60	> 60	45	TOTAL DISSOLVED SOLIDS [2]	20	10	< 10
FLUORIDE DISSOLVED [2]	20	12	< 10	TURBIDITY [4]	> 60	52	32
HARDNESS TOTAL CACO3 [2]	18	11	< 10	VANADIUM TOTAL [4]	> 60	60	40
IRON TOTAL [4]	> 60	> 60	60	ZINC TOTAL [4]	> 60	> 60	45
LEAD TOTAL [4]	> 60	> 60	49	pH [1]	< 10	< 10	< 10
MAGNESIUM DISSOLVED [2]	18	10	< 10				

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05HH0176 (SASK_29) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [1]	< 10	< 10	< 10	NITROGEN TOTAL AMMONIA [4]	60	35	23
BARIUM TOTAL [3]	35	22	12	NITROGEN TOTAL KJELDAHL [4]	50	32	20
BICARBONATE [1]	10	< 10	< 10	OXYGEN BIOCHEMICAL DEMAND [4]	60	33	22
CALCIUM DISSOLVED [1]	10	< 10	< 10	OXYGEN DISSOLVED (FIELD) [2]	17	12	< 10
CALCIUM HARDNESS [1]	10	< 10	< 10	PHOSPHOROUS TOTAL [4]	> 60	40	26
CARBON DISSOLVED ORGANIC [2]	22	13	< 10	POTASSIUM DISSOLVED [2]	25	15	< 10
CHLORIDE DISSOLVED [3]	43	23	15	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	55	35
COLIFORMS TOTAL [4]	> 60	55	35	RESIDUE NONFILTRABLE (TSS) [4]	> 60	48	30
CONDUCTANCE (FIELD) [2]	22	13	< 10	RESIDUE VOLATILE NONFILTRABLE (VSS) [4]	55	32	20
FECAL STREPTOCOCCI [4]	> 60	> 60	40	SODIUM DISSOLVED [2]	20	12	< 10
HARDNESS TOTAL CACO3 [1]	< 10	< 10	< 10	SPECIFIC CONDUCTANCE [1]	< 10	< 10	< 10
IRON TOTAL [4]	> 60	38	25	SULPHATE [2]	20	12	< 10
MAGNESIUM DISSOLVED [2]	15	< 10	< 10	TEMPERATURE WATER [4]	> 60	50	38
MANGANESE TOTAL [4]	60	35	23	TOTAL DISSOLVED SOLIDS [1]	< 10	< 10	< 10
NITROGEN DISSOLVED NO3 & NO2 [3]	50	28	17	pH [1]	< 10	< 10	< 10

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

Sampling site: SK05NB0198 (SASK_30) Percentage of error expected based on collecting 6, 12 and 26 samples

Water quality variables	Number of samples			Water quality variables	Number of samples		
	6	12	26		6	12	26
ALKALINITY TOTAL CACO3 [3]	40	23	16	OXYGEN TOTAL COD [3]	32	18	13
BICARBONATE [3]	40	22	17	pH [1]	< 10	< 10	< 10
CALCIUM DISSOLVED [3]	30	19	13	PHOSPHOROUS DISSOLVED ORTHO [4]	> 60	52	37
CARBON DISSOLVED ORGANIC [3]	30	17	12	PHOSPHOROUS TOTAL [4]	60	43	27
CHLORIDE DISSOLVED [4]	60	35	23	POTASSIUM DISSOLVED [2]	22	14	< 10
CHLOROPHYLL A [4]	> 60	60	37	RESIDUE FIXED NONFILTRABLE (FSS) [4]	> 60	60	40
COLIFORMS TOTAL [4]	> 60	> 60	60	RESIDUE NONFILTRABLE (TSS) [4]	> 60	55	35
CONDUCTANCE (FIELD) [3]	50	29	19	SODIUM DISSOLVED [3]	45	28	18
FECAL STREPTOCOCCI [4]	> 60	> 60	47	SPECIFIC CONDUCTANCE [3]	35	22	13
HARDNESS TOTAL CACO3 [3]	30	17	11	SULPHATE DISSOLVED [3]	40	24	15
MAGNESIUM DISSOLVED [3]	35	20	18	TEMPERATURE WATER [4]	> 60	52	34
NITROGEN TOTAL KJELDAHL [3]	40	24	15	TURBIDITY [4]	> 60	> 60	50
OXYGEN BIOCHEMICAL DEMAND [4]	60	40	26				

[1] 4 samples are required per year; [2] 6 samples are required per year; [3] 12 samples are required per year; [4] more than 12 samples are required per year

APPENDIX I: COMBINATIONS OF SITES TO DISCONTINUE

One site to discontinue	I_a
11	403.00
16	466.49
14	472.46
21	472.49
23	473.12
12	473.71
18	473.91
25	473.95
15	474.08
17	474.42
22	474.81
9	474.92
10	474.94
29	475.00
19	475.27
20	475.41
13	475.47

Two site to discontinue		I_a
11	16	394.02
11	14	400.00
11	21	400.02
23	11	400.66
11	12	401.24
11	18	401.45
11	25	401.48
11	15	401.61
11	17	401.96
11	22	402.35
11	9	402.46
11	10	402.47
11	29	402.54
11	19	402.80
11	20	402.95
13	11	403.00
14	16	463.49
16	21	463.51
23	16	464.15
16	12	464.74
16	18	464.94
16	25	464.98
15	16	465.11
16	17	465.45
16	22	465.84

Three site to discontinue			I_a
11	14	16	391.02
11	16	21	391.05
23	11	16	391.68
11	16	12	392.27
11	16	18	392.47
11	16	25	392.51
11	15	16	392.64
11	16	17	392.98
11	16	22	393.37
11	16	9	393.48
11	16	10	393.50
11	16	29	393.56
11	16	19	393.83
11	16	20	393.97
13	11	16	394.03
11	14	21	397.02
23	11	14	397.65
23	11	21	397.68
11	14	12	398.24
11	21	12	398.27
11	14	18	398.44
11	21	18	398.47
11	14	25	398.48
11	21	25	398.51
11	14	15	398.61

Four sites to discontinue				I_a
11	14	16	21	388.04
23	11	14	16	388.68
23	11	16	21	388.70
11	14	16	12	389.27
11	16	21	12	389.29
11	14	16	18	389.47
11	16	21	18	389.50
11	14	16	25	389.51
11	16	21	25	389.53
11	14	15	16	389.64
11	15	16	21	389.66
23	11	16	12	389.93
11	14	16	17	389.98
11	16	17	21	390.01
23	11	16	18	390.13
23	11	16	25	390.17
23	11	15	16	390.30
11	14	16	22	390.37
11	16	21	22	390.40
11	14	16	9	390.48
11	14	16	10	390.49
11	16	21	9	390.50
11	16	21	10	390.52
11	14	16	29	390.56
11	16	21	29	390.58

Five sites to discontinue					I_a
23	11	14	16	21	385.70
11	14	16	21	12	386.29
11	14	16	21	18	386.49
11	14	16	21	25	386.53
11	14	15	16	21	386.66
23	11	14	16	12	386.92
23	11	16	21	12	386.95
11	14	16	17	21	387.00
23	11	14	16	18	387.13
23	11	16	21	18	387.15
23	11	14	16	25	387.16
23	11	16	21	25	387.19
23	11	14	15	16	387.29
23	11	15	16	21	387.32
11	14	16	21	22	387.39
11	14	16	21	9	387.50
11	14	16	21	10	387.52
11	14	16	21	29	387.58
23	11	14	16	17	387.64
23	11	16	17	21	387.66
11	14	16	12	18	387.71
11	16	21	12	18	387.74
11	14	16	25	12	387.75
11	16	21	25	12	387.78
11	14	16	21	19	387.84

Six sites to discontinue						I_a
23	11	14	16	21	12	383.95
23	11	14	16	21	18	384.15
23	11	14	16	21	25	384.19
23	11	14	15	16	21	384.32
23	11	14	16	17	21	384.66
11	14	16	21	12	18	384.74
11	14	16	21	25	12	384.77
11	14	15	16	21	12	384.90
11	14	16	21	25	18	384.98
23	11	14	16	21	22	385.05
11	14	15	16	21	18	385.11
11	14	15	16	21	25	385.14
23	11	14	16	21	9	385.16
23	11	14	16	21	10	385.18
23	11	14	16	21	29	385.24
11	14	16	17	21	12	385.25
23	11	14	16	12	18	385.37
23	11	16	21	12	18	385.40
23	11	14	16	25	12	385.41
23	11	16	21	25	12	385.44
11	14	16	17	21	18	385.45
11	14	16	17	21	25	385.49
23	11	14	16	21	19	385.50
23	11	14	15	16	12	385.54
23	11	15	16	21	12	385.57

Seven sites to discontinue							I_a
23	11	14	16	21	12	18	382.39
23	11	14	16	21	25	12	382.43
23	11	14	15	16	21	12	382.56
23	11	14	16	21	25	18	382.63
23	11	14	15	16	21	18	382.77
23	11	14	15	16	21	25	382.80
23	11	14	16	17	21	12	382.90
23	11	14	16	17	21	18	383.11
23	11	14	16	17	21	25	383.15
11	14	16	21	25	12	18	383.22
23	11	14	15	16	17	21	383.28
23	11	14	16	21	12	22	383.29
11	14	15	16	21	12	18	383.35
11	14	15	16	21	25	12	383.39
23	11	14	16	21	9	12	383.40
23	11	14	16	21	10	12	383.42
23	11	14	16	21	12	29	383.48
23	11	14	16	21	18	22	383.50
23	11	14	16	21	25	22	383.54
11	14	15	16	21	25	18	383.59
23	11	14	16	21	9	18	383.61
23	11	14	16	21	10	18	383.62
23	11	14	16	21	25	9	383.64
23	11	14	16	21	25	10	383.66
23	11	14	15	16	21	22	383.67

Eight sites to discontinue								I_a
23	11	14	16	21	25	12	18	380.88
23	11	14	15	16	21	12	18	381.01
23	11	14	15	16	21	25	12	381.05
23	11	14	15	16	21	25	18	381.25
23	11	14	16	17	21	12	18	381.35
23	11	14	16	17	21	25	12	381.39
23	11	14	15	16	17	21	12	381.52
23	11	14	16	17	21	25	18	381.59
23	11	14	15	16	17	21	18	381.72
23	11	14	16	21	12	18	22	381.74
23	11	14	16	21	25	12	22	381.78
11	14	15	16	21	25	12	18	381.84
23	11	14	16	21	9	12	18	381.85
23	11	14	16	21	10	12	18	381.87
23	11	14	16	21	25	9	12	381.89
23	11	14	16	21	25	10	12	381.91
23	11	14	15	16	21	12	22	381.91
23	11	14	16	21	12	18	29	381.93
23	11	14	16	21	25	12	29	381.97
23	11	14	16	21	25	18	22	381.98
23	11	14	15	16	21	9	12	382.02
23	11	14	15	16	21	10	12	382.04
23	11	14	16	21	25	9	18	382.09
23	11	14	15	16	21	12	29	382.10

Nine sites to discontinue									I_a
23	11	14	15	16	21	25	12	18	379.495
23	11	14	16	17	21	25	12	18	379.838
23	11	14	15	16	17	21	12	18	379.969
23	11	14	16	21	25	12	18	22	380.228
23	11	14	16	21	25	9	12	18	380.337
23	11	14	16	21	25	10	12	18	380.353
23	11	14	15	16	21	12	18	22	380.359
23	11	14	15	16	21	25	12	22	380.396
23	11	14	16	21	25	12	18	29	380.417
23	11	14	15	16	21	9	12	18	380.468
23	11	14	15	16	21	10	12	18	380.484
23	11	14	15	16	21	25	9	12	380.505
23	11	14	15	16	21	25	10	12	380.521
23	11	14	15	16	21	12	18	29	380.547
23	11	14	15	16	21	25	12	29	380.585
23	11	14	15	16	21	25	18	22	380.6
23	11	14	16	21	25	12	18	19	380.681
23	11	14	16	17	21	12	18	22	380.702
23	11	14	15	16	21	25	9	18	380.709
23	11	14	15	16	21	25	10	18	380.725
23	11	14	16	17	21	25	12	22	380.739
23	11	14	15	16	21	25	18	29	380.788
23	11	14	16	17	21	9	12	18	380.811
23	11	14	15	16	21	12	18	19	380.811
23	11	14	16	17	21	10	12	18	380.827

Ten sites to discontinue										I_a
23	11	14	15	16	21	25	12	18	22	378.844
23	11	14	15	16	21	25	9	12	18	378.953
23	11	14	15	16	21	25	10	12	18	378.969
23	11	14	15	16	21	25	12	18	29	379.033
23	11	14	16	17	21	25	12	18	22	379.187
23	11	14	16	17	21	25	9	12	18	379.296
23	11	14	15	16	21	25	12	18	19	379.297
23	11	14	16	17	21	25	10	12	18	379.312
23	11	14	15	16	17	21	12	18	22	379.318
23	11	14	16	17	21	25	12	18	29	379.376
23	11	14	15	16	17	21	9	12	18	379.427
23	11	14	15	16	17	21	10	12	18	379.443
23	11	14	15	16	21	25	12	18	20	379.444
13	23	11	14	15	16	21	25	12	18	379.498
23	11	14	15	16	17	21	12	18	29	379.506
23	11	14	16	17	21	25	12	18	19	379.64
23	11	14	16	21	25	9	12	18	22	379.686
23	11	14	16	21	25	10	12	18	22	379.702
23	11	14	16	21	25	12	18	22	29	379.766
23	11	14	15	16	17	21	12	18	19	379.77
23	11	14	16	17	21	25	12	18	20	379.787
23	11	14	16	21	25	9	10	12	18	379.811
23	11	14	15	16	21	9	12	18	22	379.817
23	11	14	15	16	21	10	12	18	22	379.833
13	23	11	14	16	17	21	25	12	18	379.842

Eleven sites to discontinue											I_a
23	11	14	15	16	21	25	9	12	18	22	378.302
23	11	14	15	16	21	25	10	12	18	22	378.318
23	11	14	15	16	21	25	12	18	22	29	378.382
23	11	14	15	16	21	25	9	10	12	18	378.427
23	11	14	15	16	21	25	9	12	18	29	378.491
23	11	14	15	16	21	25	10	12	18	29	378.507
23	11	14	16	17	21	25	9	12	18	22	378.645
23	11	14	15	16	21	25	12	18	19	22	378.646
23	11	14	16	17	21	25	10	12	18	22	378.661
23	11	14	16	17	21	25	12	18	22	29	378.725
23	11	14	15	16	21	25	9	12	18	19	378.755
23	11	14	16	17	21	25	9	10	12	18	378.77
23	11	14	15	16	21	25	10	12	18	19	378.771
23	11	14	15	16	17	21	9	12	18	22	378.776
23	11	14	15	16	17	21	10	12	18	22	378.792
23	11	14	15	16	21	25	12	18	20	22	378.793
23	11	14	16	17	21	25	9	12	18	29	378.834
23	11	14	15	16	21	25	12	18	19	29	378.834
13	23	11	14	15	16	21	25	12	18	22	378.847
23	11	14	16	17	21	25	10	12	18	29	378.85
23	11	14	15	16	17	21	12	18	22	29	378.855
23	11	14	15	16	17	21	9	10	12	18	378.901
23	11	14	15	16	21	25	9	12	18	20	378.902
23	11	14	15	16	21	25	10	12	18	20	378.918
13	23	11	14	15	16	21	25	9	12	18	378.956

Twelve sites to discontinue												I_a
23	11	14	15	16	21	25	9	10	12	18	22	377.776
23	11	14	15	16	21	25	9	12	18	22	29	377.84
23	11	14	15	16	21	25	10	12	18	22	29	377.856
23	11	14	15	16	21	25	9	10	12	18	29	377.965
23	11	14	15	16	21	25	9	12	18	19	22	378.104
23	11	14	16	17	21	25	9	10	12	18	22	378.119
23	11	14	15	16	21	25	10	12	18	19	22	378.12
23	11	14	16	17	21	25	9	12	18	22	29	378.183
23	11	14	15	16	21	25	12	18	19	22	29	378.183
23	11	14	16	17	21	25	10	12	18	22	29	378.199
23	11	14	15	16	21	25	9	10	12	18	19	378.229
23	11	14	15	16	17	21	9	10	12	18	22	378.25
23	11	14	15	16	21	25	9	12	18	20	22	378.251
23	11	14	15	16	21	25	10	12	18	20	22	378.267
23	11	14	15	16	21	25	9	12	18	19	29	378.292
13	23	11	14	15	16	21	25	9	12	18	22	378.305
23	11	14	16	17	21	25	9	10	12	18	29	378.308
23	11	14	15	16	21	25	10	12	18	19	29	378.308
23	11	14	15	16	17	21	9	12	18	22	29	378.313
13	23	11	14	15	16	21	25	10	12	18	22	378.321
23	11	14	15	16	17	21	10	12	18	22	29	378.329
23	11	14	15	16	21	25	12	18	20	22	29	378.331
23	11	14	15	16	21	25	9	10	12	18	20	378.376
13	23	11	14	15	16	21	25	12	18	22	29	378.385
13	23	11	14	15	16	21	25	9	10	12	18	378.43

Thirteen sites to discontinue													I_a
23	11	14	15	16	21	25	9	10	12	18	22	29	377.314
23	11	14	15	16	21	25	9	10	12	18	19	22	377.578
23	11	14	15	16	21	25	9	12	18	19	22	29	377.641
23	11	14	16	17	21	25	9	10	12	18	22	29	377.657
23	11	14	15	16	21	25	10	12	18	19	22	29	377.657
23	11	14	15	16	21	25	9	10	12	18	20	22	377.725
23	11	14	15	16	21	25	9	10	12	18	19	29	377.766
13	23	11	14	15	16	21	25	9	10	12	18	22	377.779
23	11	14	15	16	17	21	9	10	12	18	22	29	377.787
23	11	14	15	16	21	25	9	12	18	20	22	29	377.789
23	11	14	15	16	21	25	10	12	18	20	22	29	377.805
13	23	11	14	15	16	21	25	9	12	18	22	29	377.843
13	23	11	14	15	16	21	25	10	12	18	22	29	377.859
23	11	14	15	16	21	25	9	10	12	18	20	29	377.914
23	11	14	16	17	21	25	9	10	12	18	19	22	377.921
13	23	11	14	15	16	21	25	9	10	12	18	29	377.968
23	11	14	16	17	21	25	9	12	18	19	22	29	377.984
23	11	14	16	17	21	25	10	12	18	19	22	29	378
23	11	14	15	16	17	21	9	10	12	18	19	22	378.051
23	11	14	15	16	21	25	9	12	18	19	20	22	378.053
23	11	14	16	17	21	25	9	10	12	18	20	22	378.068
23	11	14	15	16	21	25	10	12	18	19	20	22	378.069
13	23	11	14	15	16	21	25	9	12	18	19	22	378.107
23	11	14	16	17	21	25	9	10	12	18	19	29	378.109
23	11	14	15	16	17	21	9	12	18	19	22	29	378.115

Fourteen sites to discontinue														I_a
23	11	14	15	16	21	25	9	10	12	18	19	22	29	377.115
23	11	14	15	16	21	25	9	10	12	18	20	22	29	377.263
13	23	11	14	15	16	21	25	9	10	12	18	22	29	377.317
13	23	11	14	15	16	17	21	25	9	10	12	18	20	377.338
13	23	11	14	15	16	17	21	25	9	12	18	20	29	377.402
23	11	14	16	17	21	25	9	10	12	18	19	22	29	377.458
23	11	14	15	16	21	25	9	10	12	18	19	20	22	377.527
13	23	11	14	15	16	21	25	9	10	12	18	19	22	377.581
23	11	14	15	16	17	21	9	10	12	18	19	22	29	377.589
23	11	14	15	16	21	25	9	12	18	19	20	22	29	377.59
23	11	14	16	17	21	25	9	10	12	18	20	22	29	377.606
23	11	14	15	16	21	25	10	12	18	19	20	22	29	377.606
13	23	11	14	15	16	21	25	9	12	18	19	22	29	377.644
13	23	11	14	16	17	21	25	9	10	12	18	22	29	377.66
13	23	11	14	15	16	21	25	10	12	18	19	22	29	377.66
23	11	14	15	16	21	25	9	10	12	18	19	20	29	377.715
13	23	11	14	15	16	21	25	9	10	12	18	20	22	377.728
23	11	14	15	16	17	21	9	10	12	18	20	22	29	377.736
13	23	11	14	15	16	21	25	9	10	12	18	19	29	377.769
13	23	11	14	15	16	17	21	9	10	12	18	22	29	377.79
13	23	11	14	15	16	21	25	9	12	18	20	22	29	377.792
13	23	11	14	15	16	21	25	10	12	18	20	22	29	377.808
23	11	14	16	17	21	25	9	10	12	18	19	20	22	377.87

Fifteen sites to discontinue															I_a
13	23	11	14	15	16	21	25	9	10	12	18	19	22	29	377.118
13	23	11	14	15	16	21	25	9	10	12	18	20	22	29	377.266
13	23	11	14	16	17	21	25	9	10	12	18	19	22	29	377.461
13	23	11	14	15	16	21	25	9	10	12	18	19	20	22	377.53
13	23	11	14	15	16	17	21	9	10	12	18	19	22	29	377.592
13	23	11	14	15	16	21	25	9	12	18	19	20	22	29	377.593
13	23	11	14	16	17	21	25	9	10	12	18	20	22	29	377.609
13	23	11	14	15	16	21	25	10	12	18	19	20	22	29	377.61
13	23	11	14	15	16	21	25	9	10	12	18	19	20	29	377.719
13	23	11	14	15	16	17	21	9	10	12	18	20	22	29	377.739
13	23	11	14	16	17	21	25	9	10	12	18	19	20	22	377.873
13	23	11	14	16	17	21	25	9	12	18	19	20	22	29	377.937
13	23	11	14	16	17	21	25	10	12	18	19	20	22	29	377.953
13	23	11	14	15	16	17	21	9	10	12	18	19	20	22	378.003
13	23	11	14	16	17	21	25	9	10	12	18	19	20	29	378.062
13	23	11	14	15	16	17	21	9	12	18	19	20	22	29	378.067
13	23	11	14	15	16	17	21	10	12	18	19	20	22	29	378.083
13	23	11	14	15	16	17	21	9	10	12	18	19	20	29	378.192
13	23	11	14	15	16	21	25	9	10	12	19	20	22	29	378.619
13	23	11	14	15	16	21	25	9	10	18	19	20	22	29	378.823
13	23	11	14	16	17	21	25	9	10	12	19	20	22	29	378.962
13	23	11	14	15	16	17	25	9	10	12	18	19	22	29	379.055
13	23	11	15	16	17	21	25	9	10	12	18	19	22	29	379.081
13	23	11	14	15	16	17	21	9	10	12	19	20	22	29	379.093
13	23	11	14	16	17	21	25	9	10	18	19	20	22	29	379.166