A Comprehensive Examination of Water Quality:

Nut Brook / Kelligrews River Watershed,

St. John's to Conception Bay South, NL

A comparison of stream quality in a local industrial zone to points further downstream in a suburban environment

Prepared by:

Dan Ficken (B. Sc., ADWQ)

Prepared for:

Northeast Avalon Atlantic Coastal Action Program

(NAACAP)

Northeast Avalon ACAP

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Executive Summary

Nut Brook is located near the St. John's City Limits and is a headwater tributary system that flows into the Kelligrews River a few kilometers downstream. Before it reaches the Kelligrews River it crosses through the highly contaminated area of Incinerator Road. A previous study (Ficken, 2006) has revealed that this area does badly contaminate Nut Brook. This report will continue the comprehensive water and sediment quality monitoring of Nut Brook and will have a broader scope to determine if there may be impacts further downstream in the Kelligrews River. Sampling techniques used previously will be readopted and standardized for the purposes of Quality Control within this report. It was found that Nut Brook was still highly polluted and still being contaminated by the end of the 2007 sampling period, but improvements in some water quality parameters had also been made in addition to the creation of a new environmental committee focused on improving conditions in the area. The Kelligrews River showed signs of urban impact but not to the same extent as that of Nut Brook, with a few exceptions.

Acknowledgements

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1.0 Introduction

Industrial pollution is a problem for aquatic systems in urban and rural settings and can sometimes occur unnoticed for years. In recent years much concern has been expressed over the condition of Nut Brook, a tributary of the Kelligrews River located within the St. John's city limits, due to a large industrial area on Incinerator Road that the stream passes through. Concerned citizens and environmental groups had made observations of the uncontrolled industrial effects upon the river and in 2005 Northeast Avalon ACAP (NAACAP) initiated a study of the water quality in the area.

The study concluded that industrial discharges and spillages/seepages had been contributing to the contamination and destruction of Nut Brook. In addition, toxic fluids from a decommissioned landfill that had not been properly contained were suspected to be leaching into the aquatic environment. It was further concluded that more monitoring was necessary in order to scientifically document the effects and note any changes that could be occurring.

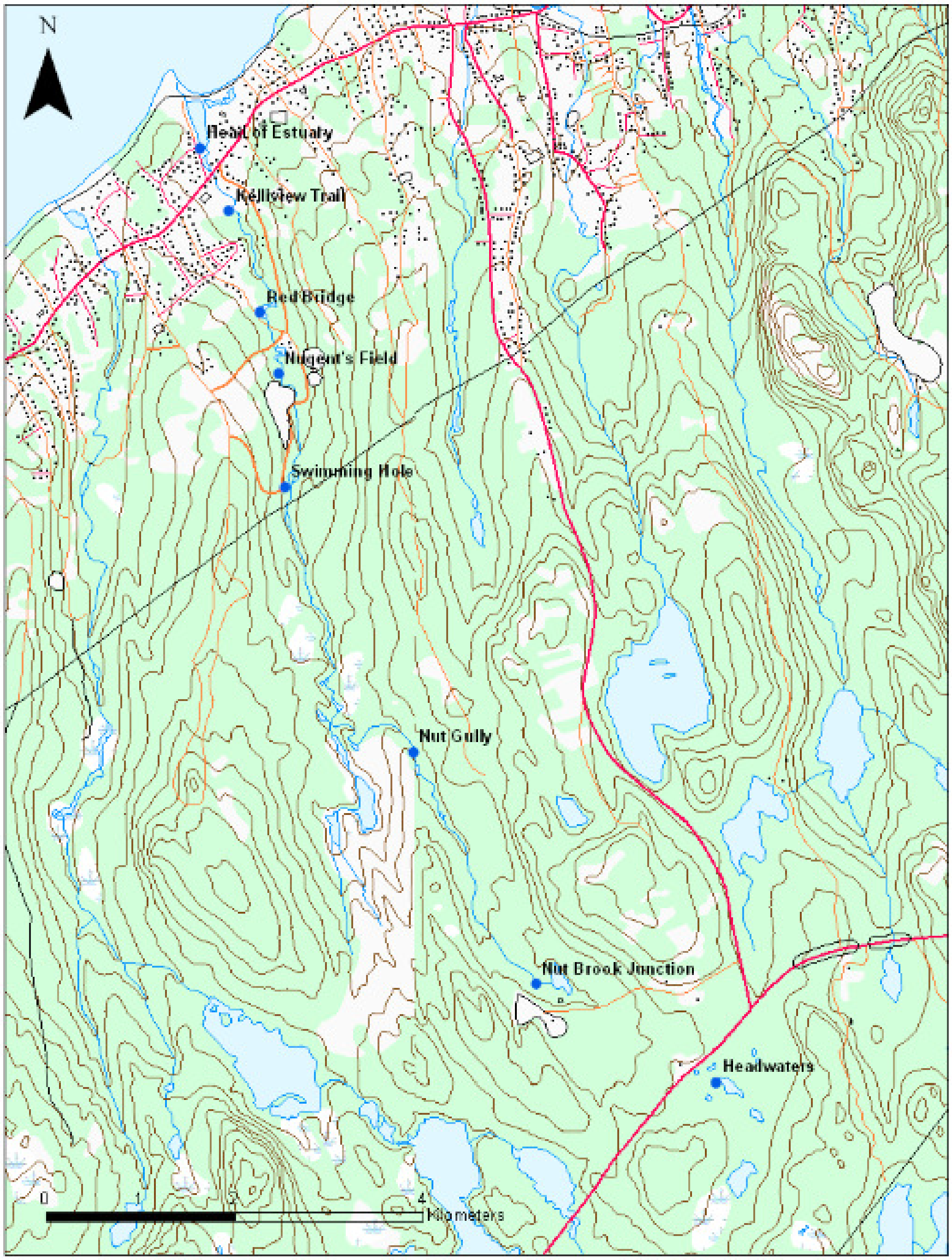
Thus in the summer months of 2006 and 2007 the monitoring program started by NAACAP continued and expanded. The results contained in this document not only provide a clear picture as to the extent of the pollution in the Incinerator Road area, but also to see if any effects could be seen further downstream where Nut Brook meets the Kelligrews River and flows through the Town of Conception Bay South. The results will also increase public awareness and aid in the future remediation and/or cooperation and partnership of businesses in the area in terms of preventing further contamination and in hopes of being stewards of the aquatic environment in which they are located. Since the end of the 2007 sampling period, a new environmental committee consisting of all three levels of government, environmental organizations, businesses and stakeholders, and citizens groups had been created to focus on minimizing the impacts upon the environment by industrial practices in the area. It is known as the Incinerator Road Environmental Committee (IREC).

1.1 Scope

During 2006 and 2007, environmental data was collected relating to the quality of water within the Nut Brook/Kelligrews River Watershed. Using information from a report by Dan Ficken (2006) that qualified and quantified the extent of pollution in Nut Brook around the Incinerator Road area, this report will further investigate whether any contaminants were carried downstream to the Kelligrews River and to determine the overall baseline quality of the water within the lower reaches of the watershed. There was much referral to the previous report by Ficken (2006), and the sampling and analysis techniques were revised and improved to make the field component smoother and the results more consistent.

2.0 Study Area

Figure 1: *Topographic map showing the Nut Brook / Kelligrews River watershed and the eight sample stations used in this study.*



Source: Department of Environment and Conservation, Water Resources Division (2008)

This study took place along the rivers of the Nut Brook/Kelligrews River Watershed in the Northeast Avalon Peninsula near Conception Bay. Land uses in the sample area included undeveloped, industrial, agricultural, recreational, highway, and suburban. Three Memorial University students who were studying the area for their Masters of Environmental Engineering degrees provided the previous map (*Figure 1*). The map shows the entire watershed system and plots the sample stations used in this project. The labels on the map coincide with the sample site locations in this report:

- Headwaters (NB01)
- Nut Brook Junction (NB02)
- Nut Gully (NB03)
- Swimming Hole (KR04)
- Nugent's Field (KR05)
- Red Bridge (KR06)
- Kelliview Trail (KR07)
- Head of Estuary (KR08)

2.0.1 Description of Watershed

The Nut Brook/Kelligrews River Watershed spans about 10km in length, flowing south to north where it discharges into Conception Bay at Cronin's Head. It begins on the western outskirts of the St. John's city limits less than a half-kilometer south of the Foxtrap weigh-scale, which is located on the Trans Canada Highway (TCH). Nut Brook and its associated primary tributaries flow north from the headwaters for about a kilometer before joining to become a single main stem. About 200m upstream of this junction, the brook and its tributaries pass underneath Incinerator Road – a heavily polluted area impacted by many types of industry that include quarrying, septic and oily waste handling, animal rendering, and leachate discharge from an unlined landfill. Although the industrial activity on Incinerator Road is constantly in flux, a good description of the general types of land use in the area is discussed in the report by Ficken (2006). This report can also be referred to for mapping and a broader description of the Nut Brook section of the watershed.

Downstream of Incinerator Road, Nut Brook then flows northwest for several kilometers through mostly wooded areas with some influence by quarries and agriculture, and then through a small series of ponds known as Nut Gully before discharging into the larger Kelligrews River. In addition to Nut Brook, a body of water called Sandy Pond not connected to Nut Brook, also feeds the Kelligrews River. The Kelligrews River then flows northward for 7 or 8 kilometers into the town limits of Conception Bay South (CBS), through the suburban residential community of Kelligrews, where it receives influence from roads, housing, stormwater runoff and piping, as well as quarries and farms. Before discharging into Conception Bay at Kelligrews Pond, the Kelligrews River has received occasional sewage inputs from the Cronin's Head Sewage Treatment Plant.

2.0.2 Site Locations

Eight sites were chosen for the two-year study covering the lengths of the two different rivers within the Nut Brook/Kelligrews River Watershed. All of the sites were numbered in the order they appeared on the rivers from upstream (01) to downstream (08). Each site was also given a code that signified if they were on Nut Brook (NB) or on the Kelligrews River (KR). Three sites were chosen on Nut Brook (named NB01 – NB03), and five sites were picked along the Kelligrews River (KR04 – KR08).

Site NB01

GPS Coordinates:

Longitude N 47' 26.355

Latitude W 052' 58.279

The first site was selected at the headwaters of the Nut Brook/Kelligrews River Watershed. According to a previous study by Ficken (2006) with sites chosen within the upper reaches of the same watershed in 2005, the headwaters of this system were located on Nut Brook upstream of all industrial, agricultural, and residential activity and also of any roadways, including the TCH. These headwaters were determined to be in pristine condition at the time the 2006 report was written, thus this same site was chosen as a reference site for the purposes of this study.

Site NB02

GPS Coordinates:

Longitude N 47' 26.733

Latitude W 052' 59.304

Another site (site 2, now named NB02) from the previous report (Ficken, 2006) was reused for this study as well. Site NB02 was located approximately 200m downstream of Incinerator Road where the primary tributaries of Nut Brook meet the main stem and join at a river junction to form one main flow of water. This site was chosen because it was contaminated (Ficken, 2006) and all the rest of the sites, as well as a residential area, were further downstream.

Site NB03

GPS Coordinates:

Longitude N 47' 27.631

Latitude W 053' 00.003

Site NB03 was located at the mouth of Nut Gully several hundred meters upstream of where Nut Brook drains into the Kelligrews River. It was speculated that this site would still show some signs of contamination from Incinerator Road nearly two kilometers upstream. This site was accessed through a quarry located between Middle Bight Road and the Foxtrap Access Road. Middle Bight Road extends south to a clearing where a path leads about a half-kilometer to the west to Nut Gully where the sample is taken at the mouth.

Site KR04

GPS Coordinates:

Longitude N 47' 28.656

Latitude W 053' 00.735

This site was chosen on the Kelligrews River several kilometers downstream of Nut Brook and just upstream from any immediate residential and industrial activity. It was the site of an abandoned outdoor swimming park, where the riverbanks were cemented in to make the edges of the former swimming pool. The river drained through a small dam that had since been partially opened up to allow better flow and fish passage. During the time period of this report the dam has been opened even further to allow much greater passage and flow. The site was accessed by either the disused access road located off Legion Road just south of the Bypass Highway, or through a quarry at the end of Red Bridge Road, just south of Ned Nugent's Park and sports field.

Site KR05

GPS Coordinates:

Longitude N 47' 29.094

Latitude W 053' 00.775

Site KR05 was located on the Kelligrews River in Ned Nugent's Ballpark next to the bridge between the rugby field and the baseball pitch. In addition, it was in close proximity to several quarries and just upstream of a residential neighborhood. It was noted that it was a popular spot for people to cross the river in all terrain vehicles, and that there was severe erosion of the riverbanks in this spot. There was also severe erosion noted at the edge of the ball field, and sand from the outfield enters the river during rainy periods.

Site KR06

GPS Coordinates:

Longitude N 47' 29.332

Latitude W 053' 00.877

This site was located on the Kelligrews River immediately upstream of the former Red Bridge of Red Bridge Road, adjacent to the Bypass Highway. Site KR06 was located within a residential neighborhood and had experienced severe deposition of sediment eroded from the edges of the raised Bypass.

Site KR07

GPS Coordinates:

Longitude N 47' 29.723

Latitude W 053' 01.058

Site KR07 was located on the Kelligrews River 150m north along a track at the end of a *cul de sac* off Kelliview Crescent. It was also 150m downstream of a small autobody garage and adjacent to a storm sewer. This site was characterised by much vegetation, but there was some unusually orange mud present along the banks.

Site KR08

GPS Coordinates:

Longitude N 47' 29.967

Latitude W 053' 01.220

The furthest site downstream was chosen about a hundred meters upstream of the mouth of the Kelligrews River at Cronin's Head. This site was located on Pond Road downstream of almost all of the developed lands in Kelligrews and on the fringes of the estuary at Conception Bay. It was a nesting and feeding area for various duck species and a small park was put there. It was also just upstream of the primary sewage treatment plant at Cronin's Head and should be noted that because of the tidal influence on this site, there can sometimes be brackish backflow sent upstream, and there was a sedimentation problem noted there as well.

3.0 Methodology

A comprehensive work plan was devised to maximize the efficiency of the field sampling and the subsequent sample analysis. Although methods were devised in the previous report on Nut Brook (Ficken, 2006), the field techniques were improved to save time but also to minimize errors and to be of a standard protocol for consistency. More labs were used for better analysis of the samples as well. A site catalogue sheet was redesigned for the most organised recording of all the related data collected in the field. Additionally, all of the results had to be organized and interpreted in order to make any conclusions and recommendations.

3.1 Sampling

Fieldwork was conducted effectively each year with the assistance of a Green Team provided by the Conservation Corps NL (CCNL) and of NAACAP staff. Eight samples plus a duplicate were taken on each of the four sampling sweeps per year. The sample dates in 2006 fell on July 25th, August 8th, August 21st, and September 5th, the latter two occurred during rain events. The sample dates in 2007 fell on July 23rd, August 8th, August 28th, and September 23rd, with the first two dates occurring during rain events. The bottles and caps were rinsed three times with sample water before a grab sample was taken in accordance with standard protocol. In some cases a bucket tied to a rope (also rinsed three times with sample water) was used to obtain an appropriate representative sample. Where needed, samples taken for metal analysis were fixed with strong nitric acid (HNO_3), and samples taken for nutrient analysis were fixed with a strong sulphuric acid (H_2SO_4). This ensured they were properly preserved before arriving at the appropriate labs to be analysed. Latitude and longitude coordinates were taken with a GPS at each site to pinpoint their exact locations. Photographs were taken at each site to aid in site identification (*Section 2.0.2*), and show some of the environmental impacts affecting the area as well (*Section 4.1*).

3.2 Field Analysis

Water testing was carried out in the field using a Hydrolab Quanta-G multiparameter monitoring sonde, also known as a probe. The Hydrolab instrument was designed to conveniently and accurately determine the values of various water quality indicators very quickly using sophisticated sensors. The indicators or parameters that the probe was able to determine (with units in brackets if applicable) were:

- Temperature (°C),
- pH,
- Dissolved Oxygen, DO (mg/L, and in %),
- Specific Conductance (µS/cm),
- Salinity (PSS, very similar to ppt),
- Total Dissolved Solids, TDS (g/L),
- Oxygen Reduction Potential, ORP

Before any field sampling the sensors on the probe were cleaned and calibrated to known standards to ensure consistently accurate results. Detailed field sheets were produced in order to record all the data collected properly.

3.3 Lab Analysis

Water and sediment samples were collected in the field and sent to various labs for analysis on multitudes of parameters. Water samples were sent to the Department of Earth Sciences ICP-MS lab at Memorial University of Newfoundland (MUN) to be analysed for metals and trace elements. Separate samples were sent to Jacques – Whitford Inc. for *E. coli* analysis. Water and sediment samples were sent to the Environmental Sciences Lab at Environment Canada in Moncton for nutrient analysis and PAH analysis (in sediment only). In addition, samples were analysed in the graduate analytical lab in MUN's Department of Chemistry for total suspended and dissolved solids.

4.0 Results and Discussions

This section will characterize the water quality of Nut Brook and Kelligrews River at each of the sample locations as effectively as possible. The data collected over the two years of sampling was extensive, in total 64 sets of samples were taken during this period. Handling this amount of data was difficult at best, and much simplifying was needed in order for this report to take on a more manageable and readable form. However, the water quality results and interpretations in the following sections and subsections are quite valuable and provide a detailed picture of the environmental health of Nut Brook and the Kelligrews River.

Data means of all the raw values for each parameter were derived for each sampling season and graphs produced to make interpretations easy to understand and to provide a comparison of results between 2006 and 2007. The means were, in every case, compared with the data means of a reference site that was previously shown to be in a pristine state (Ficken, 2006) and known to be in the headwaters of Nut Brook, upstream of all major human activity. In most cases, the water quality of the two rivers when compared with the reference site was found to be worse downstream, and in some cases, particularly in Nut Brook, the quality was found to be far worse. Overall, Nut Brook was found to generally be in poor health compared with the Kelligrews River. While not necessarily always in poor health, the Kelligrews River showed signs of the impacts of suburban land use when compared to the data obtained from the reference site, and may have also been somewhat affected by the water flowing in from Nut Brook upstream.

The following sections detail the water quality characteristics and trends interpreted from the data collected in the 2006 – 2007 sampling periods. For more information, see also Ficken (2006).

4.1 Field Observations

This subsection will provide the mean results and their interpretations of the data collected over the two sampling periods with the Quanta–G water quality monitoring sonde. Where possible data was evaluated with a standard guideline to indicate the status of the water quality at certain sites. All of the raw data charts are found in Appendix A. Visual observations were made of the water quality as well, and examples of degraded water quality can be observed in the following photographs. It should be noted that a major sedimentation event occurred just prior to the third sampling sweep in 2007 as well, which affected the entire reach of Nut Brook from the source of contamination at Incinerator Road and affecting all of the Kelligrews River.

The image on top left shows a stagnant pool of raw sewage and oil before it flows into Nut Brook. Further downstream, it enters Nut Brook just upstream of Incinerator Road next to the decommissioned incinerator and causes severe contamination

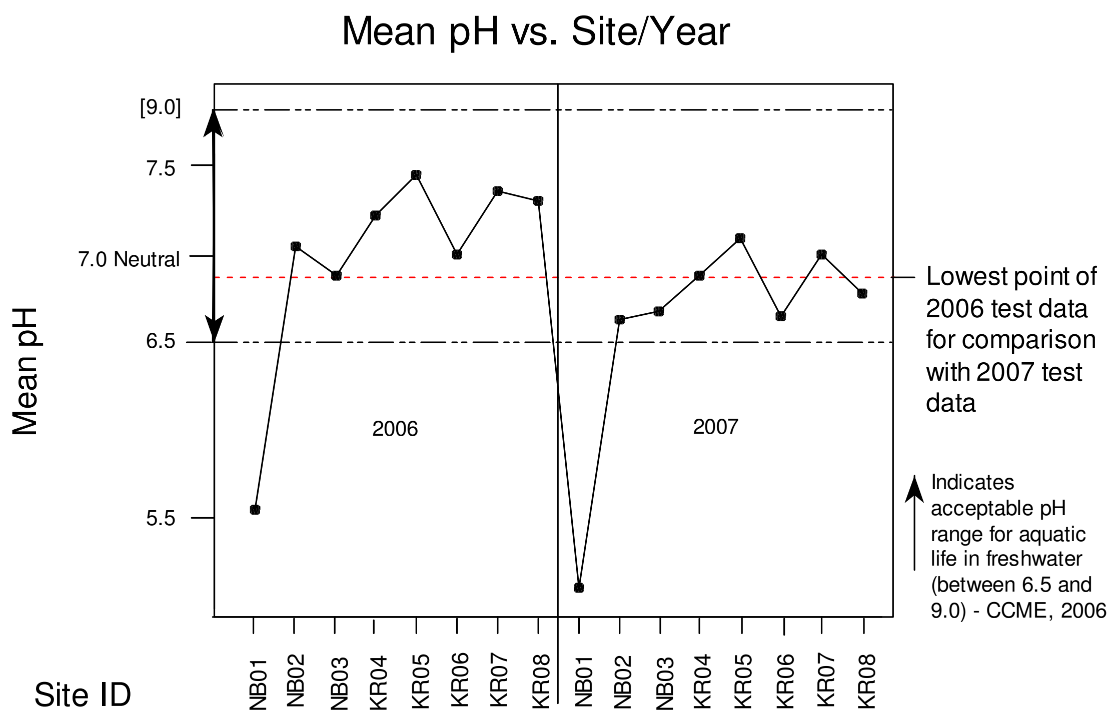
(below right).

The image on the bottom left shows the 2007 Green Team working in the Kelligrews River at site 5. This site is a recreational area used mainly for baseball, soccer, and rugby; however, it suffers from high sedimentation, as there is no vegetative buffer next to the baseball diamond. During heavy rains, sand and silt is washed from the outfield directly into the river.

4.1.1 pH

The calculated mean values for pH per sample site per year are located in the following graph. The raw values for pH for each site on each sweep are located in Appendix A.

Figure 2: *Mean pH values per sample site per year showing the healthy range of pH as denoted by the CCME guidelines.*



As can be seen by the graph (*Figure 2*) the mean pH was generally lower in 2007 than in 2006. However, in all cases except for the reference site the mean pH values were between 6.5 and 7.5, which is within an acceptable range for aquatic life (CCME, 2006). It is unclear as to why the mean pH values may have generally been lower in 2007 because it is difficult to characterise a normal value for pH in an environmental system due to normal fluctuations that occur over periods of time. The reference pH was quite low, however it was known that because of tannins and high organic matter present at the site, which was standing water, the pH would naturally be lower. It was expected and thus shown (*Figure 2*) that the mean pH would be higher downstream where there was good flow and a higher buffering capacity due to minerals naturally dissolved in the water.

4.1.2 Specific Conductance

The calculated mean values for specific conductance per sample site per year are located in the following graph. The raw values for specific conductance for each site on each sweep are located in Appendix A.

Figure 3: *Mean values of specific conductance (*µS/cm*) per sample site per year showing a guideline derived from knowledge of normal values of conductivity for natural river systems in the Northeast Avalon Peninsula.*

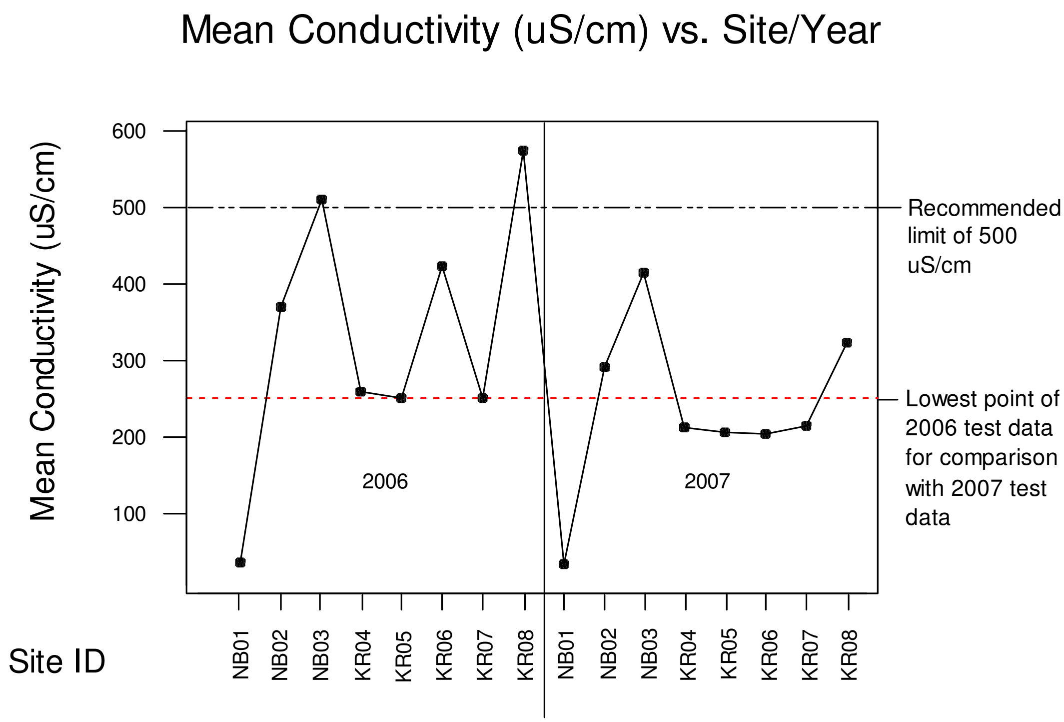


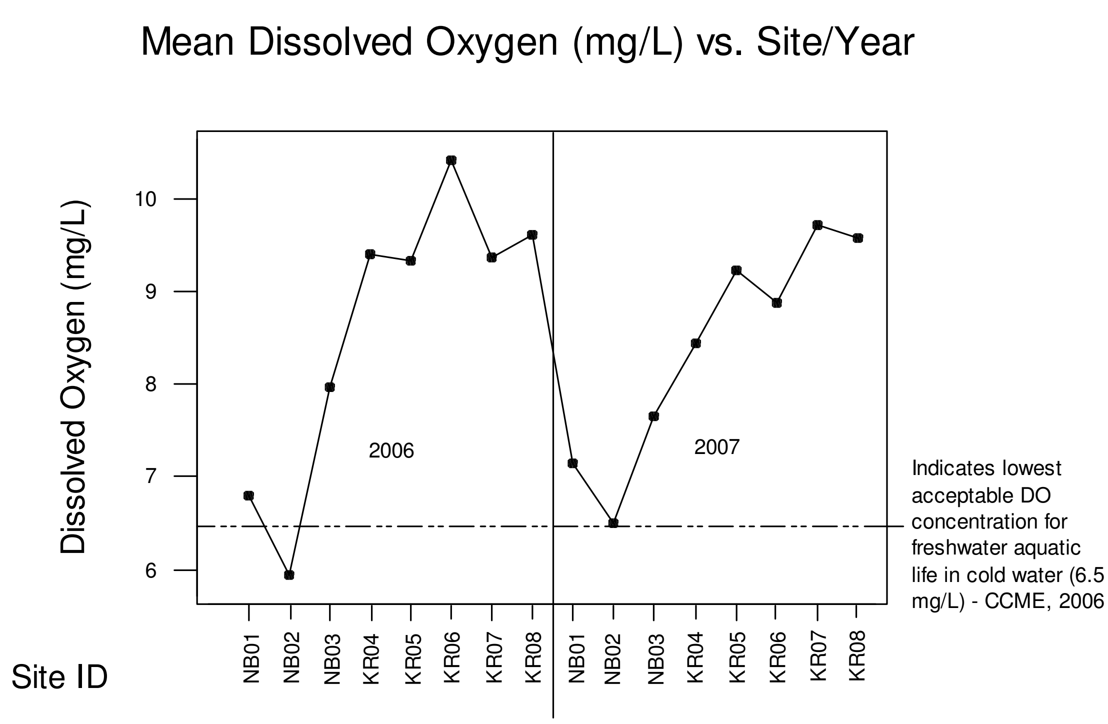
Figure 3 shows that the 2007 mean values for conductivity were slightly lower than 2006 values, although the trend is almost identical. Despite the necessary removal of a major outlier (*Appendix A*), site 8 showed the highest mean value in 2006 (*Figure 3*). The reason for this was most likely due to the tidal influx that occurs at the mouth of the Kelligrews River, causing seawater to mix with fresh water at site 8. Seawater has a much higher conductivity than fresh water, thus it was most likely the cause of the spike at site 8. This is a normal environmental condition and should not be a cause for concern. However, due to occasional sewage released into the water from a nearby wastewater treatment plant, it was possible that this may have also affected the conductivity values at site 8 if there was enough tidal backflow. Section 4.5 shows that there was sewage entering the Kelligrews River at site 8 at times in 2006, so this could be a possibility.

When compared with the reference site, all of the sample sites downstream had a higher mean conductivity. To some degree this is normal because as a river runs its course, it will pick up impurities from runoff, the substrate, and the bedrock, causing the conductivity to be somewhat higher. In site 3, however, the mean conductivity was much higher than even most of the other sample sites, and site 2 had higher mean values than most of the sites in the Kelligrews River, especially in 2006 (*Figure 3*). The mean conductivity at Site 3 was so high in 2006 at 512 µS/cm that it breached the derived guideline of 500 µS/cm, which was nearly 15 times higher than the mean value of the reference site at 34 µS/cm. This is most likely indicative of the impacts of industrial activity coming form the Incinerator Road area. It should also be pointed out that site 6 had a conductivity spike in 2006 as well. It is unknown as to why this would be, but speculatively it could be due to the erosion of fine material off the side of a nearby highway, which did not have stabilized sidelines at the time.

4.1.3 Dissolved Oxygen (DO)

The calculated mean values for Dissolved Oxygen (DO) per sample site per year are located in the following graph. The raw values for DO for each site on each sweep are located in Appendix A.

Figure 4: *Data means for Dissolved Oxygen (mg/L) per sample site per year showing the lowest acceptable concentration of DO as derived in the CCME guidelines (2006).*



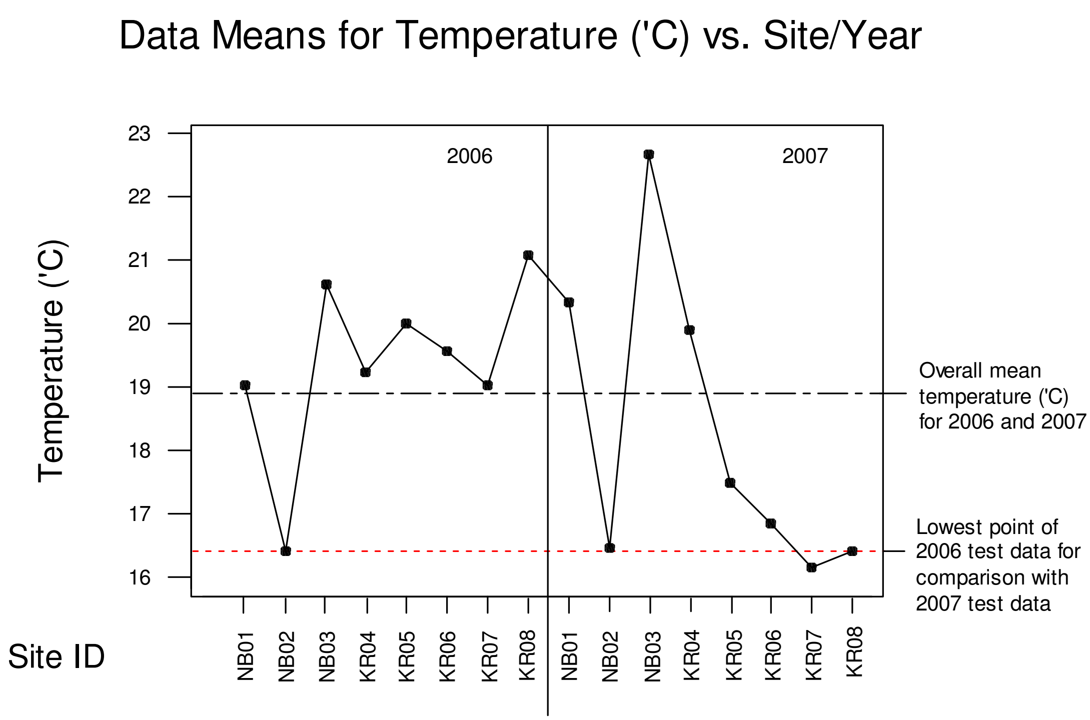
Between the 2006 and 2007 data means for dissolved oxygen (DO), it was hard to determine whether the levels were better or worse in either sampling period (*Figure 4*). However, a certain trend was identified in that in both periods the DO was lower in Nut Brook than it was in the Kelligrews River. The mean DO values on the Kelligrews River fluctuated somewhat, but all fell above the CCME guideline of 6.5 mg/L, which is the minimum concentration of oxygen needed to support coldwater/freshwater aquatic species. With the exception of site 2, all of the mean concentrations downstream in 2006 – 2007 were higher than the reference concentrations, which were much closer to the minimum acceptable amount (*Figure 4*). The lower mean values of DO in the reference sites were most likely attributable to the fact that the headwaters of Nut Brook consist of a standing pond with negligible flow, which would naturally cause a lower DO level.

In both sampling periods, site 2 had low mean DO concentrations of 5.95 mg/L and 6.50 mg/L in 2006 and 2007 respectively (*Figure 4*). The raw values (*Appendix A*) show that in 2006 the DO had even dropped as low as 4.28 mg/L, and below 5.00 mg/L on another occasion, and in 2007 on one occasion the DO had dropped to 5.35 mg/L. These concentrations are too low for a properly functioning aquatic environment. The low concentrations of DO in site two were most likely caused by poor water quality from the Incinerator Road area and also by the amount of quarry sediment that had collected there, essentially choking the vegetation and causing the river to become significantly shallower at this point. The image of site 2 in Section 2.0.2 clearly shows the effect of heavy sedimentation on the environmental state of the river.

4.1.4 Temperature

The calculated mean values for Temperature (°C) per sample site per year are located in the following graph. The raw values for Temperature for each site on each sweep are located in Appendix A.

Figure 5: Data means for Temperature (°C) per sample site per year showing the mean temperature of all the data from 2006 to 2007.



There was not much difference in the temperature trends between 2006 and 2007, except that in 2007 on average, Nut Brook was a bit warmer and the Kelligrews River was somewhat colder than in 2006 (*Figure 5*). The Kelligrews data means for temperature may have been lower in 2007 due to natural climatic deviations from one year to the next. The mean temperature of both periods together was just under 19°C, which is in an appropriate range for coldwater/freshwater aquatic species. However, looking at some of the data means individually, the average temperature at site 3 was quite high in 2007 at about 23°C (*Figure 5*), which is near the difference between a coldwater and a warm water aquatic environment. It was uncertain as to why the temperature would be so high here, although it could possibly be linked to a contaminant in the water, such as salt, that was causing the water to retain more heat during the summer. As observed in sections 4.1.2 (specific conductance) and 4.1.5 (salinity), site 3 was generally saltier than most of the other fresh water sites.

Interestingly site 2 was consistently low in temperature, with an average temperature in both sampling periods of approximately 16.5°C (*Figure 5*). Although this was a site close to a significant source of contamination from Incinerator Road, the temperature was relatively low. It would be expected to be higher, but it is possible that the high percentage of canopy cover in and around the site, especially for several hundred metres upstream of it, may have caused enough shade to significantly cool the water down at this site.

4.1.5 Salinity

The calculated mean values for Salinity (PSS) per sample site per year are located in the following graph. The raw values for Salinity for each site on each sweep are located in Appendix A.

Figure 6: *Data means for Salinity (PSS) per sample site per year showing the mean salinity values of all the data from 2006 to 2007.*

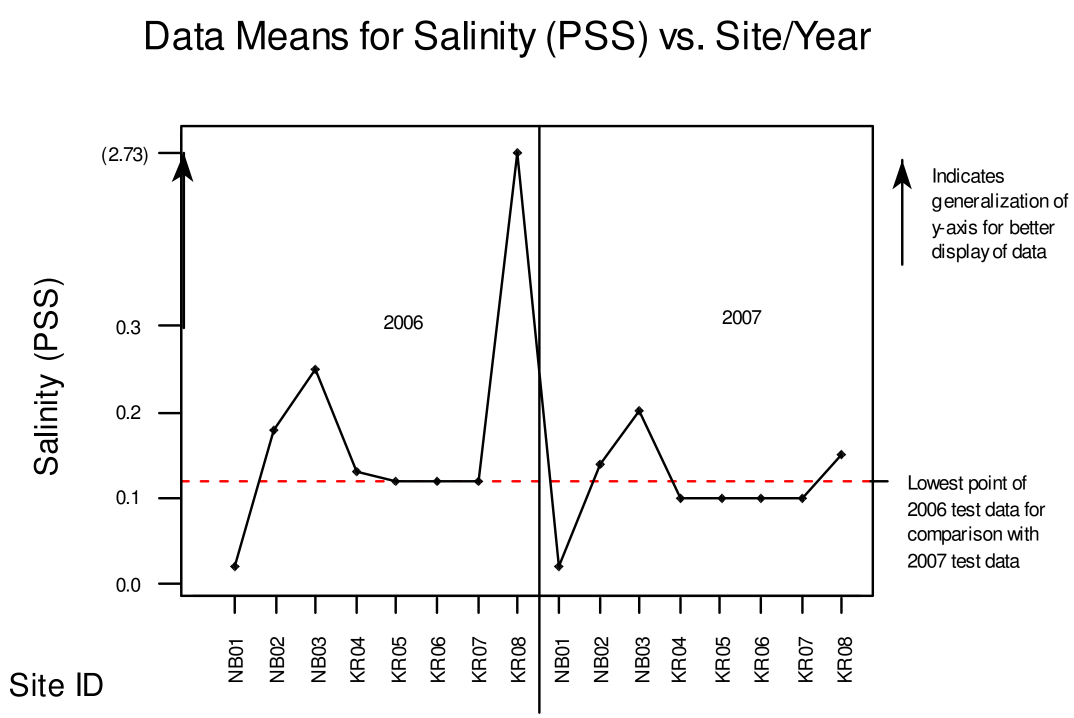


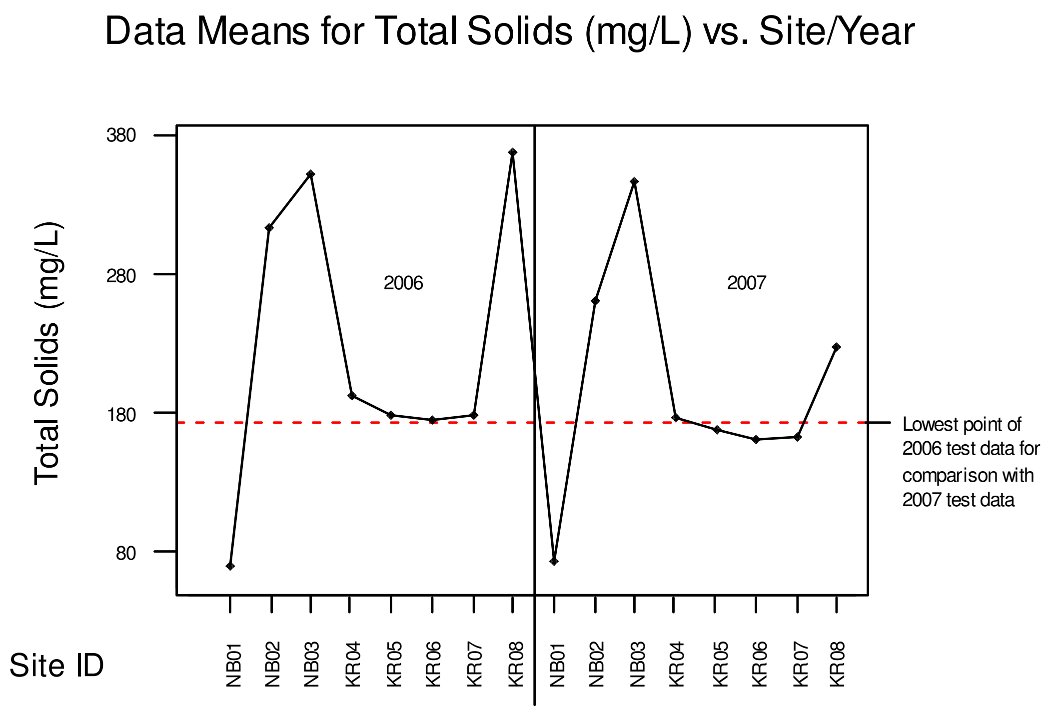
Figure 6 shows that all of the sites in 2007, except for the reference site, were slightly less saline than in 2006. However, the trend is essentially identical from 2006 – 2007 (*Figure 6*). The mean salinity in the reference site for both years was about 0.02 PSS (essentially the same as 0.02 ppt). The salinity everywhere else was comparatively much higher. For example, with the exception of site 8, the mean salinity values in the Kelligrews River ranged from 0.10 PSS to 0.13 PSS from 2006 – 2007. And in Nut Brook, the mean salinity values were higher again; site 3 being the highest at a mean value of 0.25 in 2006 (*Figure 6*). While much higher than the mean reference values, the levels of salinity in Nut Brook and the Kelligrews River, (excluding site 8), are still relatively low. According to the Venice System of Classification (1959), water may begin to get noticeably saltier at 0.50 PSS, and up to 3.0 PSS water is within the brackish range. Site 8 was high in the brackish range in 2006 with a mean salinity of 2.73 PSS (*Figure 6*), this was most likely due to the tidal backflow up the estuary at this location, naturally making the water more salty at certain periods of the day.

Despite the relatively low levels of salinity in the sites upstream of site 8, the trend in Figure 3 shows the consistent levels of salinity in Kelligrews River, and the raised levels in Nut Brook. The Kelligrews River flows through an urban area, and could account for some of the salt loadings observed in this stretch (i.e. in the form of residual winter road saltings) in addition to natural salts picked up by the river as it flows through the substrate and bedrock. The levels in Nut Brook were significantly higher than in the reference site, and higher than they were in most of the Kelligrews River. This indicates that Nut Brook was experiencing increased loadings of a salty substance at the time.

4.2 Total Solids

The total solids (TS) refer to the concentration of the solid material, dissolved and suspended within the water column. The calculated mean values for Total Solids (TS) per sample site per year are located in the following graph. The raw values for TS for each site on each sweep are located in Appendix A.

Figure 7: *Data means for Total Solids (TS) per sample site per year showing the mean TS values of all the data from 2006 to 2007.*

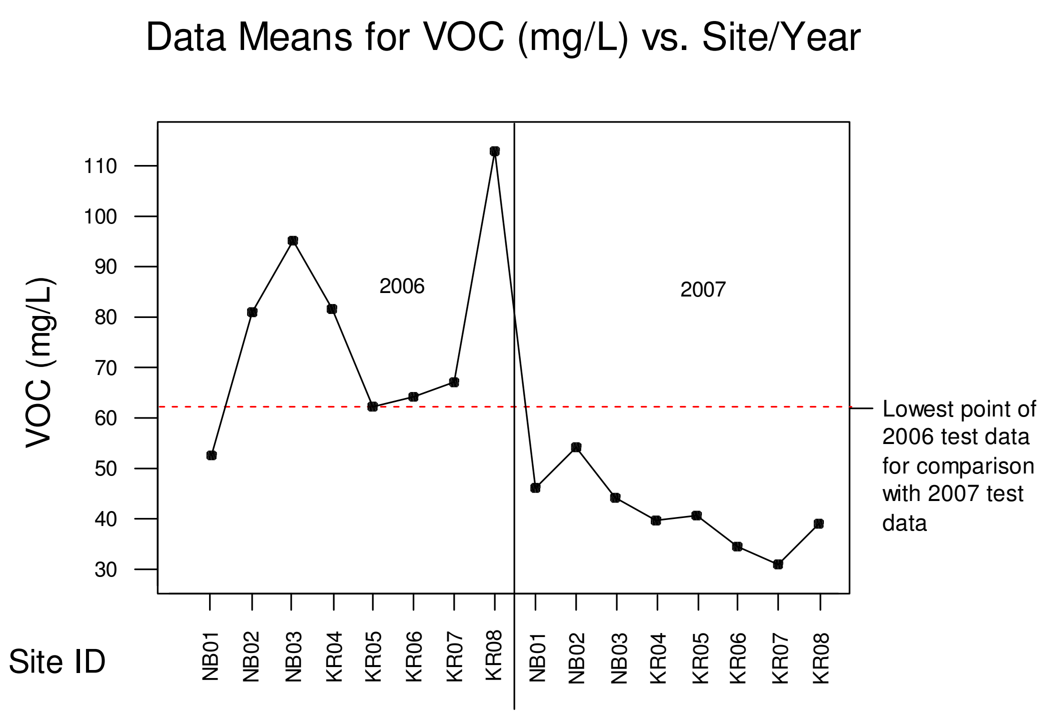


The overall trend from 2006 – 2007 is the same, although the data means are slightly lower in 2007 than in 2006 (*Figure 7*). With the exception of site 8, which receives backflow from the sea, and occasional untreated sewage discharges, Nut Brook had the highest mean concentrations of TS, with the highest being site 3 at approximately 350 mg/L (*Figure 7*). The reference site had a relatively low concentration of TS at approximately 70 mg/L (*Figure 7*). The sites on Nut Brook downstream of Incinerator Road experience sedimentation, in addition to dissolved constituents from various contaminants that enter the river system, which may explain why the concentration of TS was higher. The Kelligrews River experiences this at a much lower level and is why the TS was not as high here. Generally, TS of less than about 500 mg/L is relatively acceptable for a river system before it begins to affect aquatic life and habitat.

4.2.1 Volatile Organic Compounds (VOCs)

Volatile Organic Compounds (VOCs) are a component of total solids and are the proportion of material that can gas off in certain conditions. The calculated mean values for VOCs per sample site per year are located in the following graph. The raw values for VOCs for each site on each sweep are located in Appendix A.

Figure 8: *Data means for Volatile Organic Compounds (VOCs) in mg/L per sample site per year showing the mean VOC values of all the data from 2006 to 2007.*



From Figure 8 it was observed that there were less VOCs in 2007 than in 2006. In fact, with the exception of site 2, there were less VOCs in 2007 in the downstream sites than in the reference site, indicating a possible improvement for this parameter. The 2006 data showed the usual trend of more constituents in Nut Brook, as well as in site 8.

4.3 Nutrients

Elements such as phosphorus and nitrogen are classified as nutrients in environmental systems because aquatic and terrestrial plants need them to survive. However, although there is naturally a fine balance of these nutrients found in the environment, an anthropogenic input can cause problems. Combined with other factors such as pH and temperature, too much nitrogen, particularly in the form of unionized ammonia (NH_3^-) is highly toxic to aquatic life. Too much phosphorus and nitrogen combined can also lead to eutrophication, which can cause substantial algae growth. Nitrogen can also be an indicator of sewage loadings into the river. Sites 2 and 3 had an increased concentration of both phosphorus and nitrogen over most of the other sites, with the highest concentrations being in site 2 (*Appendix A*).

4.3.1 Ammonia-N and NH_3

One of the main ways ammonia can be introduced to the environment is through industrial discharge, such as in raw sewage and landfill leachate. The calculated mean values for Ammonia-N (mg/L) per sample site per year are located in the following graph. Ammonia-N, also called total ammonia, includes the total concentration of both the toxic unionized ammonia, NH_3, and the relatively harmless ionized ammonia, NH_4^+. The raw values for Ammonia-N for each site on each sweep are located in Appendix A.

Figure 9: *Data means for Ammonia-N (mg/L) per sample site per year showing the mean Ammonia-N values of all the data from 2006 to 2007.*

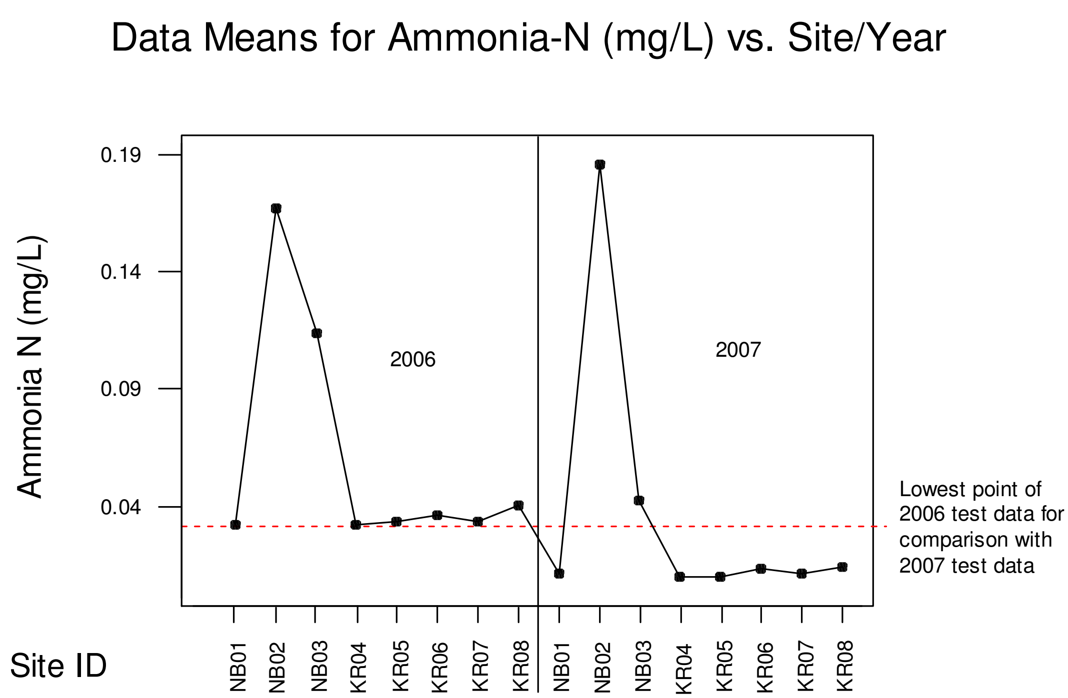


Figure 9 shows that although the mean concentrations of ammonia-N in most of the sites were close to that of the reference site, sites 2 and 3 had increased levels of total ammonia. Since the mean concentrations of ammonia-N in the reference site for 2006 and 2007 were similar to that of the mean concentration of the rest of the sites (with the exception of sites 2 and 3), it was determined that much of the ammonia present may have been naturally occurring due to the high amounts of organic matter present (*Appendix A*). However, site 2 was almost certainly affected by the sewage inputs from activity on Incinerator Road, and it was possible that some of the ammonia may have traveled downstream as far as site 3, especially in 2006. In 2007, site 2 had the highest mean concentration of ammonia at approximately 0.180 mg/L (*Figure 9*). It was also observed from Figure 9 that, with the exception of site 2, the mean concentrations of total ammonia in all the rest of the sites were lower in 2007. This was expected because the major sewage loadings likely ended at some point in 2007.

There is a CCME guideline related to the protection of aquatic life (CCME, 2006) for the highly toxic unionized ammonia of 0.019 mg/L; however, the concentration and the toxicity depends on increasing levels of pH and temperature. NH_3 levels for all the raw data were derived from a formula that was a function of pH and temperature found in the CCME document (2006); however it was found after performing the calculations that the values of unionized ammonia were very low in all the sites in both years, with the highest concentration being at a level of 0.0006 mg/L NH_3 in site 4 during sweep 3 in 2007. Thus, the levels of unionized ammonia calculated from the total ammonia were highly negligible in terms of toxicity.

4.3.2 Phosphorus

Phosphorus loadings can occur from many sources: agricultural runoff, such as from fertilizer use; and industrial runoff, such as from major disturbances in the soil from a quarry or a building development. Loadings can occur from industrial effluent as well. According to the textbook by Wetzel, *Limnology: Lake and River Ecosystems* (2001), freshwater is generally considered uncontaminated if it contains between 0.01 and 0.05 mg/L of phosphorus; a higher concentration would indicate an anthropogenic input. Phosphorus is one of the main nutrients responsible for eutrophication, which occurs when aquatic ecosystem receives so much phosphorus (along with other nutrients, such as nitrogen compounds) that vegetative and algal growth flourish and light and oxygen becomes depleted, resulting in a highly compromised aquatic environment. The CCME (2006) describes the level of eutrophication as a concentration of phosphorus that ranges from ultra-oligotrophic at <0.004 mg/L, to hyper-eutrophic at >0.10 mg/L. The calculated mean values for Phosphorus (mg/L) per sample site per year are located in the following graph. The raw values for Phosphorus for each site on each sweep are located in Appendix A.

Figure 10: *Data means for Phosphorus (mg/L) per sample site per year showing the mean Phosphorus values of all the data from 2006 to 2007, as well as the trophic ranges of phosphorus concentrations.*

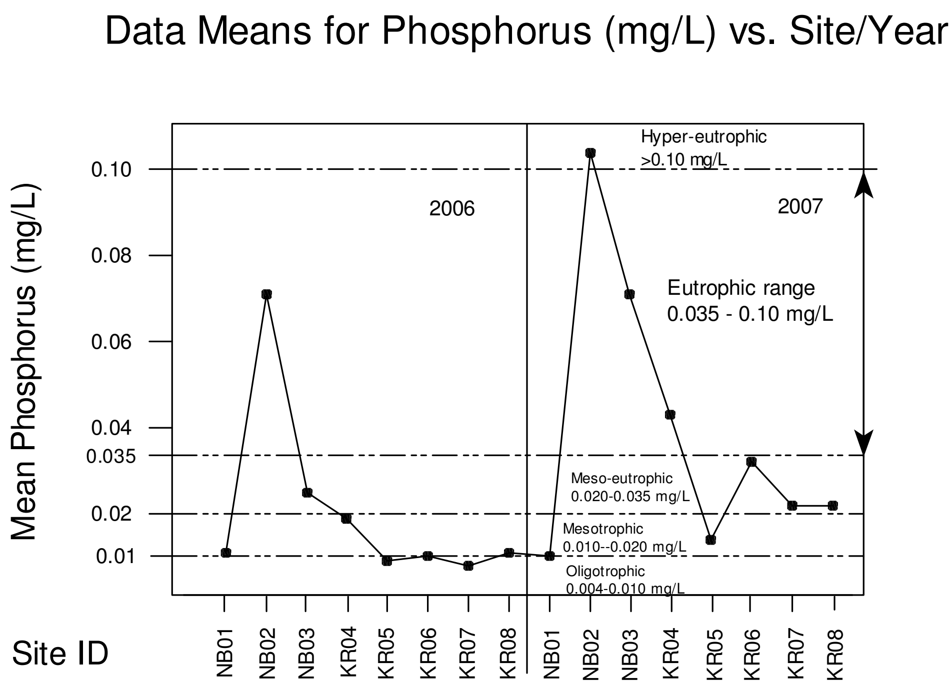


Figure 10 shows a higher overall concentration of phosphorus in 2007 than in 2006. In both years sites 2 and 3 had the highest respective mean concentrations of phosphorus, and compared with the mean values of the reference site, site 2 had a much higher mean concentration in both years and was reflective of its proximity to Incinerator Road. The mean concentration of site 2 in 2007, at 0.104 mg/L, was so high that the water at this site was classified as hyper-eutrophic. Site 4 had the next highest mean concentrations after site 3, and may have reflected the transport of phosphorus from upstream. In 2007, both sites 3 and site 4 were classified as eutrophic. Overall, the sites in the Kelligrews River showed mean values to be similar to or not much higher than in the reference site (*Figure 10*). During the third sweep in 2007, there was a major sedimentation event that contaminated the entire stretch of Nut Brook from Incinerator Road and the Kelligrews River with fine silt. The raw results in Appendix A show that the metal content was increased somewhat with the associated loadings; the raw results for phosphorus in the appendix also indicate this correlation, as the phosphorus concentration increased during this sample sweep as well, and may have been the reason for the higher mean concentrations in 2007. It is unknown if there were any agricultural inputs of phosphorus at the time.

4.4 Metals and Trace Elements

Samples of water and sediment were collected for the metals and trace elements analysis, and comprised of the largest set of data collected by far. Due to a limitation in time, and in the interest of portraying this report in a less confusing fashion, the concentrations of metals and trace elements in both water and sediment will be summarized as comprehensively as possible. For some further insight and some interesting graphs, a portion of a draft report by the three Masters students who were also studying this data is attached in the appendix of this report (*Appendix B*); permission was granted to do so.

In the water samples, the metals content was generally higher in 2007 (*Appendix A*). The data means followed similar trends to many other parameters in this report, in that the reference site usually had the lowest concentrations; Nut Brook normally had higher concentrations of metals and trace elements than the Kelligrews River, with the exception of site 8, due to tidal backflow; and Site 2 usually had the highest concentrations overall, and often by far. It was possible that a major sediment event that occurred just prior to the third sampling sweep in 2007 may have caused the metals concentrations to generally be higher during that sampling period.

Some of the highlights from the data means in the water samples are as follows:

- Aluminum may have been naturally occurring due to the fact that although in many cases it surpassed the CCME Guidelines for the protection of aquatic life (2006) (*Appendix A*), it was concentrated high in the reference site and in many cases higher than the other sites.

- Calcium occurred in low concentrations in the reference site (a maximum mean of 811 ppb), however had high concentrations in site 2 (up to 28,875 ppb), and was much higher than that of the other sites (*Appendix A*).

- Chloride was generally low in most of the sites, however it was quite high in site 3 (up to 178,885 ppb) (*Appendix A*). It was mentioned in Section 4.1.5 that site 3 was generally more saline than the other sites.

- Copper sometimes surpassed the CCME guidelines (2006) in many of the sites, but it also occurred in high concentrations comparable to those in the other sites in the reference site, indicating that copper was potentially a naturally occurring substance in this case.

- Iron occurred in high concentrations in Nut Brook, particularly in site 2. This was most likely attributable to the input of landfill leachate just upstream of this site. The iron concentrations surpassed the CCME guidelines of 300 ppb in Nut Brook for both years. It was at its highest in 2007 at site 2 with a concentration of 2107 ppb (*Appendix A*).

- While some lead occurred in the reference site, it was most concentrated in Nut Brook, especially at site 2. According to the level of hardness of the water (*Section 4*.6) the CCME guideline for lead in water (2006) is 1.0 ppb at a hardness of less than 60 mg/L, and 2.0 ppb with a hardness between 60 and 120 mg/L. In 2007, the lead concentrations in Nut Brook surpassed the derived CCME guidelines with the highest concentration being 2.37 ppb at site 2, and 1.80 ppb at site 3 (*Appendix A*).

- Magnesium, manganese, silicon, and sulphur occurred in low concentrations in the reference site but much higher concentrations at site 2, although site 8 had the highest concentrations of magnesium (*Appendix A*), and may have been due to the tidal back flow experienced at that site.

- Uranium concentrations were high in Nut Brook compared with the other sites (*Appendix A*).

- Zinc concentrations were high enough to surpass the CCME guidelines, however, some of the highest levels come from the reference site, meaning that the zinc concentrations were most likely naturally occurring.

Some of the highlights from the data means in the sediment samples are as follows:

- Site 7 exhibits high arsenic that greatly surpasses the CCME sediment guideline Probable Effect Level (PEL) of 17.0 ppm (CCME, 2006) at a concentration of 53.3 ppm in 2007 (*Appendix A*), all of the other sites on the Kelligrews River surpass the Interim guideline of 5.9 ppm in 2006, but the highest again being at site 7.

- Site 3 surpassed the Interim CCME sediment guideline for cadmium of 0.6 ppm (CCME, 2006) in 2006 and 2007 at 0.9 ppm in 2006. Sites 4 and 7 surpassed it in 2006 and sites 6 and 8 surpassed it in 2007 (*Appendix A*). The PEL of 3.5 ppm was not surpassed.

- Chromium surpassed the Interim CCME sediment guideline of 37.3 ppm (CCME, 2006) in 2006 at sites 5 – 8, the highest concentrations being at site 8 at approximately 79 ppm (*Appendix A).* The PEL of 90.0 ppm was not surpassed.

- Site 8 showed high concentrations of copper in 2006 at 59.1 ppm (*Appendix A*), surpassing the Interim CCME sediment guideline of 37.3 ppm (CCME, 2006).

- Iron was quite high at site 7 in 2006 as well at an average concentration of 140,032 ppm (*Appendix A*). This is compared with the next highest value of 61,325 ppm in site 2, and to the reference site at 4991 ppm (*Appendix A*). Similarly in 2007 site 7 showed by far the highest concentrations of iron compared with the other sites at a concentration of 96,839 ppm (*Appendix* A). It was noted that this site is located about 100m downstream from an automotive garage. A large colony of iron bacteria was noticed at site 7 as well. These bacteria commonly flourish when iron rich sediment begins to leach iron into the water.

- Very high levels of lead surpassing the CCME sediment guideline PEL of 91.3 ppm (CCME, 2006) were found in sites 4 and 8 in 2006, the highest being 132.1 ppm at site 4. It also surpassed the PEL guideline at sites 3, 5, and 6 in 2006. In 2007, lead surpassed the PEL guideline in sites 3 and 4, but also in the reference site, where its highest concentration was 58.0 ppm (*Appendix A*).

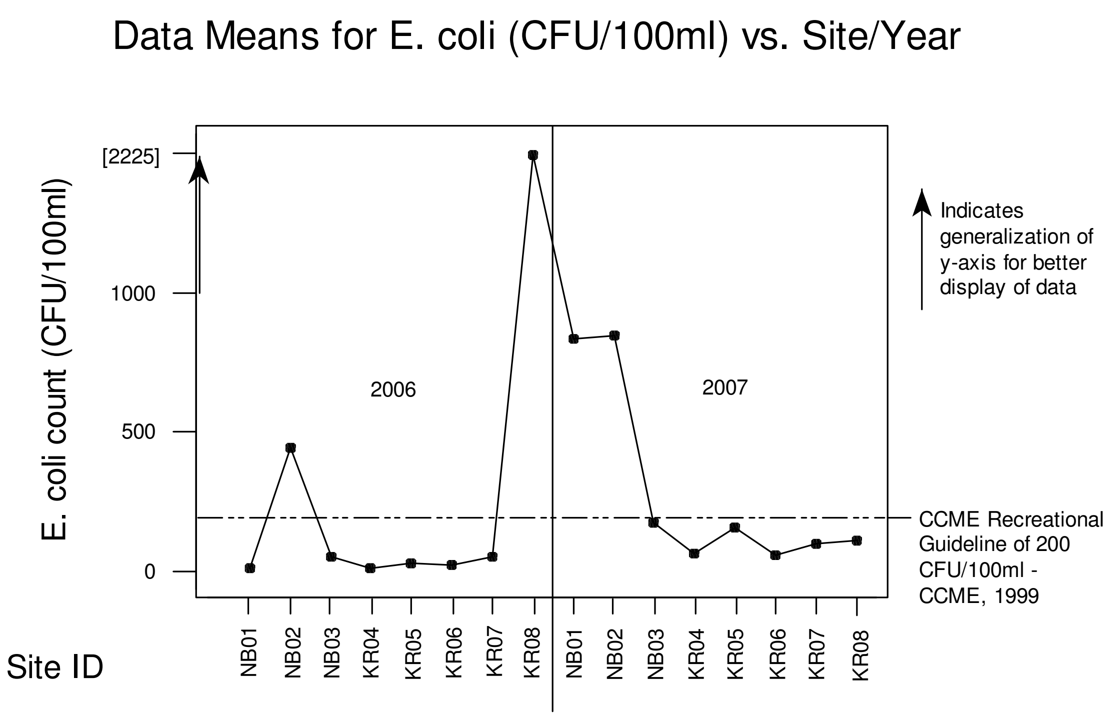
- High concentrations of thallium were found in sites 3 and 6 in 2006, the highest being 27.6 ppm in site 6 in comparison with the reference site at a concentration of 5.0 ppm (*Appendix A*). Thallium is known to be toxic at high concentrations, however there are currently no CCME related guidelines for thallium in sediment.

- The Kelligrews River along with site 3 on Nut Brook showed high concentrations of zinc in 2006, most of which surpassed the Interim CCME sediment quality guideline of 123.0 ppm (CCME, 2006). Site 7 greatly surpassed the PEL guideline of 315.0 ppm at an average concentration of 424.8 ppm. Similarly, in 2007, sites 4, 6, and 7 surpassed the Interim guideline for zinc (*Appendix A*).

4.5 *Escherichia coli*

In a previous study (Ficken, 2006), it was determined by comparison with the reference site that Nut Brook had been contaminated with high concentrations of *Escherichia coli* (*E. coli)*, indicating that raw sewage had been entering the stream. The data from 2006 and 2007 showed that Nut Brook was continuing to be contaminated (*Figure 11*), mostly within the vicinity of site NB02. To a lesser extent, the Kelligrews River also showed signs of slight contamination, except for site KR08, which was sometimes heavily contaminated. Research suggests that *E. coli* can survive in water for several days up to 260 days, depending upon its competition with other microbes present and the temperature of the water (Flint, 1987). This suggests that *E. coli* can potentially be discharged via raw sewage at a point source on the river and be carried downstream for as long as it can survive.

Figure 11: *Data means for* E. coli *per site per year showing the related CCME recreational guideline.*



Ideally, it would be normal to compare the data results of a known contaminated site (or study site) with the data collected from a reference sample, however in the case of the 2007 results the reference site also appeared to be highly contaminated with *E. coli* at a mean value of 838 Colony Forming Units (CFU). It is unclear as to why this value was so high, however on the second sweep in particular the count was 2900 CFU (*Appendix A*), which could either mean there was some cross contamination with another sample, or an event had occurred that would cause this number to be so high. There were no known anthropogenic sources of contamination at the time of writing so it was possible the reference site had been contaminated by an animal, since on the 4th sweep site NB01 was also recorded to have a count of 430 CFU (*Appendix A*). This is an unfortunate circumstance because it makes a proper comparison impossible. Since the data from the previous study (Ficken, 2006) as well as the 2006 data in this report show a low instance of *E. coli* in the reference site (10 CFU or less), the 2007 data can be compared with the mean reference values from the previous years.

When compared with the appropriate reference data, it was shown that site NB02 was very contaminated with *E. coli* exceeding the recreational CCME guideline of 200 CFU (2003) at least 50% of the time in both 2006 and 2007. At times, this guideline had been significantly exceeded, such as in sweep 1 in 2007 when NB02 had a count of 2200 CFU *E. coli* (*Appendix A*); a dangerously high level of contamination. There had been known instances of heavy raw sewage pollution from a trench about 300m upstream that discharged into the main tributary leading into Nut Brook, which was the most likely cause of the high *E. coli* counts in NB02. Many of the discharges were known to have occurred in mid August 2006 and tapering to mid August of 2007, as reflected by the raw results (Appendix A), with reports of occasional occurrences in the spring of 2006 as well.

Further downstream, site NB03 also showed signs of *E. coli* contamination, particularly in 2007. There were two occasions in 2007 when NB03 exceeded the CCME recreational guideline of 200 CFU (*Appendix A*), the highest instance being 360 CFU during the first sample sweep that year. It was noted that NB02 was significantly contaminated at the same time and was most likely linked to a recent discharge of raw sewage upstream.

With the exception of site KR08, the Kelligrews River was relatively low in *E. coli* when compared with the reference data. There was a higher instance overall between sites KR04 and KR07 in 2007 than there was in 2006 (*Figure 11*). A presence of moderate *E. coli* counts along the Kelligrews River between KR04 and KR07 could be reflective of the suburban/residential area it passes through. However it is possible that, as discovered previously in Flint's report (1987), the *E. coli* bacteria in the sewage discharged in Nut Brook could have survived and may also have been transported downstream to the Kelligrews River.

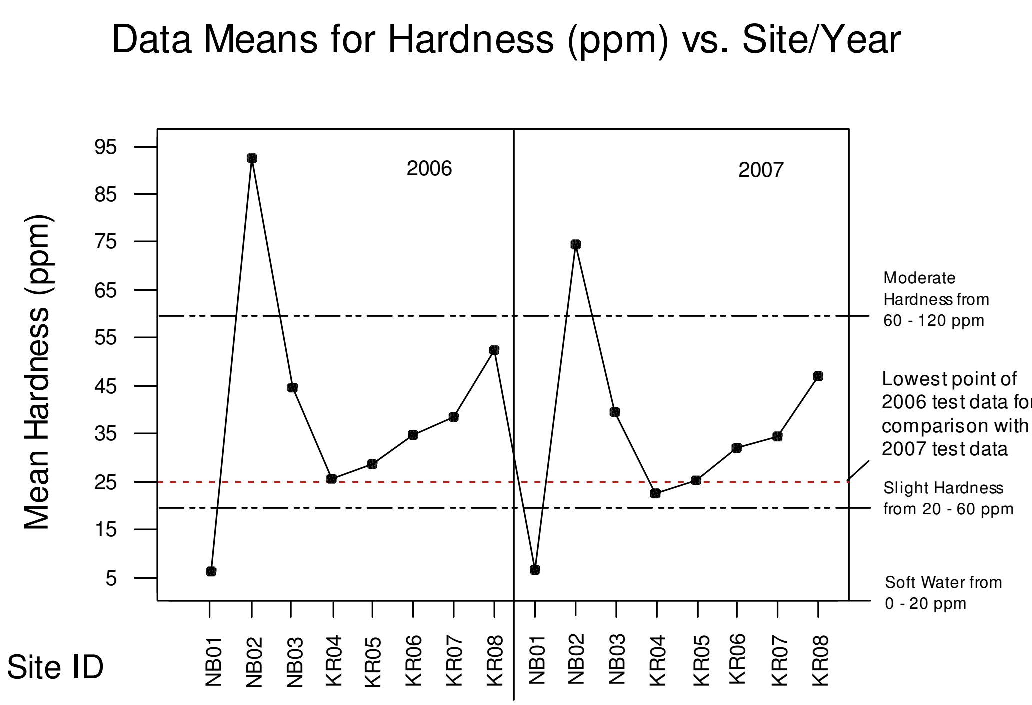
Site KR08 was highly contaminated, particularly in 2006 when it had a maximum count of 5600 CFU at the beginning of the sampling period and a minimum count of 900

CFU (*Appendix A*). It was less affected in 2007 as its maximum *E. coli* count was 140 CFU (*Appendix A*). There is a primary sewage treatment plant 100m downstream of site KR08 at Cronin's Head, and at the time of sampling, particularly in 2006, there were problems with leakage and the associated lift station for this facility. This led to serious discharges of untreated sanitary waste in the Kelligrews River at this point. There is some tidal influence at the mouth of the Kelligrews River (Cronin's Head), which most likely caused some backflow of water, contaminating the Kelligrews River upstream at site KR08.

4.6 Hardness

Hardness is calculated depending on the concentrations of certain metal ions present in the water: Calcium, Magnesium, Iron, Manganese, Aluminum, Strontium, and Barium. In very hard water, toxic metals such as lead and cadmium are less likely to be absorbed through the gills of fish due to the increased concentrations of Ca^{2+} and Mg^{2+} ions (Murphy, 2007). The calculated mean values for Hardness (ppm) per sample site per year are located in the following graph. The raw values for Hardness for each site on each sweep are located in Appendix A.

Figure 12: *Data means for Hardness (ppm) per sample site per year showing the mean hardness of all the data from 2006 to 2007 and the hardness classification ranges.*



The trend shown from the data means for hardness from 2006 to 2007 were almost identical, although the degrees of hardness per site were slightly lower in the 2007 data (*Figure 12*). All of the sample sites stayed within the same ranges of hardness between 2006 and 2007, however. The water in the reference site was classified as being soft water. With the exception of site 2, all the water in the other sites were classified as slightly hard, and the water in site 2 was classified as moderately hard (*Figure 12*).

The reference site had soft water because there was a low concentration of metals and a lot of organic material present, and minimal anthropogenic input. Besides site 2, the other sites showed an expected range of hardness for points along a flowing river. A river will naturally pick up elements and metals along its course from the bedrock and runoff from the land. In addition, because the rivers flow through an industrial site and also an urban area there would also be an expected input of more trace elements and metals to contribute to the hardness of the water. The only exception is site 2, which would be expected to have water that would fall in the same classification as the other sites downstream, but since it was just downstream of Incinerator Road, site 2 was contaminated with many substances, including sediment and landfill leachate, both of which could contribute metals to the water, hence increasing the overall mean hardness.

4.7 Polycyclic Aromatic Hydrocarbons (PAHs)

Sediment samples were taken on one occasion for the purposes of examining them for a range of polycyclic aromatic hydrocarbons (PAHs), low soluble substances known to be carcinogenic and to have adverse environmental effects in air, soil, and water. PAHs are much more stable in sediment than in water, and so only sediment samples were taken for the analysis of this parameter. The raw results for PAHs in 2006 and 2007 are located in Appendix A, as well as the CCME guidelines where applicable.

Observing the data in the appendix, in 2006 PAHs were only found in some of the sediment samples of sites 1 – 3 and occasionally barely detectable in site 8. In 2007, PAHs were often found in sites 1 – 3 again but also occasionally in site 4. The concentrations of PAHs in sites 1 and 2 were generally lower in 2007 than in 2006, but the 2007 data also shows that there were generally higher concentrations of PAHs in site 3 in 2007 than in 2006 (*Appendix A*). It is quite possible that the PAH occurrence in site 4 in 2007 was due to the higher concentrations found upstream in site 3.

None of the samples exceeded the related CCME guidelines in 2006, however fluoranthene did exceed the CCME guideline of 21.2 ppb in 2007 with a concentration of 30 ppb (*Appendix A*). Pyrene almost exceeded the CCME guideline of 53 ppb in 2007 as well with a concentration of 51 ppb (*Appendix* A).

In 2006, site 2 usually had a slightly higher concentration of PAHs than site 3 (the highest being 43 ppb of Inde 0 (1, 2, 3 – C, D) Pyrene, (*Appendix A*)), and usually both sites 2 and 3 had higher concentrations than the reference site. The fact that the reference site had any concentrations at all was interesting, but may have reflected a naturally occurring concentration due to the high organic matter present at that site. It could also have been due to the fact that the Trans Canada Highway was located about 200m downstream and that the headwaters could be experiencing fallout from air born exhaust particles from the traffic. Site 2 was contaminated by industrial activity and landfill leachate and was in a closer proximity to the now disused tepee incinerator located on the old landfill site (Ficken, 2006), it is quite possible that PAHs had been introduced to Nut Brook from the activity on Incinerator Road, and some of this may have been transported as far downstream as site 3.

The transport of PAHs may have continued in 2007 due to the fact that they seemed to be concentrating in site 3 downstream of site 2. The fact that they were beginning to appear in site 4 also reinforces this; although it was possible there was also an unknown input of certain PAHs to this site at the time as well. The lower instance of PAHs in site 2 may indicate a lessening of contamination from activity on Incinerator Road, however more research is needed in this area.

5.0 Conclusions

Since it had been established in a previous study that Nut Brook was highly contaminated in the Incinerator Road area (Ficken, 2006), through the findings of this report it was shown that from Incinerator Road, Nut Brook continued to be a contaminated site, and that industrial discharges were still occurring up to the end of the last sampling period. It was also observed however, that while the discharges were very heavy between 2006 and early 2007, they were lessoning by the end of 2007. It was noted that vegetation was beginning to grow back where there was major sediment damage as well. From this report, it was shown that even further downstream, Nut Brook at site 3 also showed some indicators of adverse water quality, meaning that contaminants could possibly be traveling further downstream from Incinerator Road. The Kelligrews River, while showing some signs of stress, was relatively clean compared with Nut Brook. It is possible that the contaminants from Nut Brook had been diluted or disassociated before reaching the sample sites on the Kelligrews River, and that any indicators of deteriorating water quality was more likely due to the fact that the Kelligrews River flows through an urbanized area and was receiving more inputs from road runoff than direct industrial discharges.

The Kelligrews River is still, however, at risk of eventual transport of contaminants downstream from the contaminated sites upstream. Site 8 on the Kelligrews River was much more polluted at times, however, this was due not only to its suburban location, but also because there was a wastewater treatment plant near the site that sometimes malfunctioned and discharged directly into the Kelligrews River. Because of its location near the sea, site 8 also received daily influxes of salt water, which can naturally increase the concentrations of metals and trace elements in the river at this location and sometimes make it appear more contaminated than it is.

From this report, it was found that in comparison with the 2006 data, the 2007 data showed there were lower concentrations of dissolved and suspended constituents and salt in the rivers, and except for site 2, a lower occurrence of total ammonia was observed in most of the sites as well. However, more metals and trace elements were detected in the 2007 data for Nut Brook, as well as increased phosphorus concentration, *E. coli* counts, and PAH content, which indicated that conditions in the Incinerator Road area, while in some ways improving, were not up to standard. In addition, the changes from 2006 to 2007 were mostly slight, except in some of the more contaminated sites on Nut Brook. Much work is needed to ensure the future of these river systems is safe from further anthropogenic damage.

6.0 Recommendations

Building on recommendations made in the previous report by Ficken (2006), it is suggested that government, NGOs, students, and business carry out continued monitoring of these rivers, particularly in the Incinerator Road area. Working together, further discharges can be prevented, and the proper installation of new industrial facilities, site improvements, roads, and housing can occur much easier. It is recommended further that industry should strive to comply with national environmental standards to ensure that any environmental degradation is minimal or non-existent. It is also recommended that urban developments be closely monitored in the proximity of the Kelligrews River, particularly new developments to ensure that they do not adversely affect the water quality downstream as well.

Since the end of the last sampling period, then provincial Minister of Environment and Conservation, Clyde Jackman, formed an environmental committee called the Incinerator Road Environmental Committee (IREC). Members of government, non-profit organizations, industry and the public are a part of this committee and it formed out of concern for the overall health and future management of Nut Brook. This is a very positive initiative in terms of how the land is being used in the area. It sparks interest about the situation and environmental stewardship from all parties involved. From the viewpoint of this report, committees such as the IREC are highly recommended to mobilize the government, business, and the public into action concerning the health of their watershed.

7.0 References

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Appendix A – *All raw sample data, means, and observations*

2006 results from Hydrolab water quality monitoring probe and field observations:

Sweep	Site ID	River	Rain Event	Site Location
1	1	Nut Brook	N (0.6mm)	Headwaters
1	2	Nut Brook	N (0.6mm)	Nut Brook Junction
1	3	Nut Brook	N (0.6mm)	Nut Gully
1	4	Kelligrews	N (0.6mm)	Swimming Hole
1	5	Kelligrews	N (0.6mm)	Nugent's Field
1	6	Kelligrews	N (0.6mm)	Red Bridge
1	7	Kelligrews	N (0.6mm)	Kelliview Trail
1	8	Kelligrews	N (0.6mm)	Head of Estuary
2	1	Nut Brook	N (0.00 mm)	Headwaters
2	2	Nut Brook	N (0.00 mm)	Nut Brook Junction
2	3	Nut Brook	N (0.00 mm)	Nut Gully
2	4	Kelligrews	N (0.00 mm)	Swimming Hole
2	5	Kelligrews	N (0.00 mm)	Nugent's Field
2	6	Kelligrews	N (0.00 mm)	Red Bridge
2	7	Kelligrews	N (0.00 mm)	Kelliview Trail
2	8	Kelligrews	N (0.00 mm)	Head of Estuary
3	1	Nut Brook	Y (13.0 mm)	Headwaters
3	2	Nut Brook	Y (13.0 mm)	Nut Brook Junction
3	3	Nut Brook	Y (13.0 mm)	Nut Gully
3	4	Kelligrews	Y (13.0 mm)	Swimming Hole
3	5	Kelligrews	Y (13.0 mm)	Nugent's Field
3	6	Kelligrews	Y (13.0 mm)	Red Bridge
3	7	Kelligrews	Y (13.0 mm)	Kelliview Trail
3	8	Kelligrews	Y (13.0 mm)	Head of Estuary
4	1	Nut Brook	Y (4.8 mm)*	Headwaters
4	2	Nut Brook	Y (4.8 mm)*	Nut Brook Junction
4	3	Nut Brook	Y (4.8 mm)*	Nut Gully
4	4	Kelligrews	Y (4.8 mm)*	Swimming Hole
4	5	Kelligrews	Y (4.8 mm)*	Nugent's Field
4	6	Kelligrews	Y (4.8 mm)*	Red Bridge
4	7	Kelligrews	Y (4.8 mm)*	Kelliview Trail
4	8	Kelligrews	Y (4.8 mm)*	Head of Estuary

* = incl. previous day precip. (0.8 mm)

2006 results from Hydrolab water quality monitoring probe and field observations:

Sweep	Site ID	Time	Date	Sediment	Flow
1	**1**	11:05 AM	7/25/2006	N	Standing
1	**2**	12:00 PM	7/25/2006	N	Poor
1	**3**	1:45 PM	7/25/2006	N	Moderate
1	**4**	10:25 AM	**7/26/2006**	N	Restricted
1	**5**	3:10 PM	7/25/2006	N	Good
1	**6**	3:35 PM	7/25/2006	N	Moderate
1	**7**	4:00 PM	7/25/2006	N	Good/Fast
1	**8**	4:20 PM	7/25/2006	N	Moderate/Tidal
2	**1**	10:20 AM	8/8/2006	Y**	Standing
2	**2**	11:10 AM	8/8/2006	Y**	Poor
2	**3**	12:30 PM	8/8/2006	Y**	Moderate
2	**4**	1:25 PM	8/8/2006	Y**	Restricted
2	**5**	1:50 PM	8/8/2006	Y**	Good
2	**6**	2:05 PM	8/8/2006	Y**	Moderate
2	**7**	2:25 PM	8/8/2006	Y**	Good/Fast
2	**8**	2:35 PM	8/8/2006	Y**	Moderate/Tidal
3	**1**	10:30 AM	8/21/2006	Y	Standing
3	**2**	11:20 AM	8/21/2006	Y	Poor
3	**3**	12:55 PM	8/21/2006	Y	Moderate
3	**4**	2:00 PM	8/21/2006	Y	**Moderate**
3	**5**	2:30 PM	8/21/2006	Y	Good
3	**6**	2:55 PM	8/21/2006	Y	Moderate
3	**7**	3:10 PM	8/21/2006	Y	Good/Fast
3	**8**	3:40 PM	8/21/2006	Y	Moderate/Tidal
4	**1**	12:45 PM	9/5/2006	Y	Standing
4	**2**	1:45 PM	9/5/2006	Y	Poor
4	**3**	2:30 PM	9/5/2006	Y	Moderate
4	**4**	4:25 PM	9/5/2006	Y	Restricted
4	**5**	5:00 PM	9/5/2006	Y	Good
4	**6**	5:20 PM	9/5/2006	Y	Moderate
4	**7**	5:35 PM	9/5/2006	Y	Good/Fast
4	**8**	5:45 PM	9/5/2006	Y	Moderate/Tidal

** = not used

2006 results from Hydrolab water quality monitoring probe and field observations (raw data in **bold** indicates an unusual result):

Sweep	Site ID	Depth	pH	Conductivity (mS/cm)	DO (mg/L)	ORP (mV)
1	**1**	8"	5.37	0.030	7.9	357
1	**2**	4"	6.96	0.399	7.21	287
1	**3**	10"	7.00	0.548	7.1	302
1	**4**	18"	7.15	0.249	9.6	327
1	**5**	18"	7.41	0.225	8.81	289
1	**6**	24"	6.83	0.215	10.85	272
1	**7**	12"	7.31	0.216	8.74	272
1	**8**	12"	7.09	1.231	8.59	275
2	**1**	9"	6.07	0.034	7.25	469
2	**2**	3"	7.17	0.399	7.35	301
2	**3**	8"	6.89	0.556	8.94	349
2	**4**	20"	7.29	0.257	9.57	327
2	**5**	20"	7.48	0.255	9.63	323
2	**6**	21"	7.07	0.247	10.65	327
2	**7**	6.5"	7.36	0.258	9.52	301
2	**8**	10"	7.22	0.276	10.21	332
3	**1**	N/A	5.14	0.033	6.18	428
3	**2**	2.5"	7.08	0.317	**4.94**	283
3	**3**	6.5"	6.83	0.373	7.14	295
3	**4**	N/A	7.32	0.175	9.53	284
3	**5**	9.5"	7.55	0.172	9.65	282
3	**6**	8"	7.04	0.175	10.08	300
3	**7**	N/A	7.47	0.186	9.81	269
3	**8**	N/A	7.18	0.221	**10.74**	296
4	**1**	N/A	5.64	0.040	5.87	387
4	**2**	N/A	6.96	0.367	**4.28**	318
4	**3**	N/A	6.75	0.594	8.7	327
4	**4**	N/A	7.07	0.350	8.91	279
4	**5**	N/A	7.32	0.347	9.27	302
4	**6**	N/A	7.03	0.333	10.09	313
4	**7**	N/A	7.24	0.340	9.42	301
4	**8**	N/A	7.67	17.300	8.89	260

2006 results from Hydrolab water quality monitoring probe and field observations (raw data in **bold** indicates an unusual result):

Sweep	Site ID	Temperature ('C)	Salinity (PSU)	Replicates	Error Sources
1	1	20.66	0.02	N	Stirred up mud
1	2	18.48	0.19	N	Stirred up sediment
1	3	**23.76**	0.26	D/Nutrients	N
1	4	18.33	0.12	D/Solids	N
1	5	**22.55**	0.11	T/Micro	N
1	6	**22.26**	0.1	N	N
1	7	21.52	0.1	D/Metals	N
1	8	**23.61**	0.61	N	Brackish water?
2	1	19.23	0.02	N	Stirred up sediment
2	2	16.06	0.19	T/Micro	N
2	3	21.29	0.27	D/Sediments	N
2	4	20.55	0.12	N	N
2	5	20.01	0.12	D/Solids	N
2	6	19.79	0.12	D/Nutrients	N
2	7	19.52	0.12	D/Metals	N
2	8	21.55	0.13	N	N
3	1	18.75	0.02	N	No trowel
3	2	15.97	0.15	D/Sediments	V. Shallow
3	3	19.78	0.18	D/Metals	N
3	4	19.74	0.08	N	N
3	5	19.42	0.08	D/Nutrients	N
3	6	18.32	0.08	D/Solids	N
3	7	18.28	0.09	N	N
3	8	19.87	0.11	D/Clostridium	V.Little sediment
4	1	17.48	0.02	N	N
4	2	15.12	0.17	D/Nutrients	Low water level
4	3	17.63	0.29	D/Solids	N
4	4	18.32	0.17	D/Metals	N
4	5	18.02	0.17	N	N
4	6	17.86	0.16	T/Micro	N
4	7	16.77	0.16	D/Metals/Seds	N
4	8	19.33	**10.05**	N	N

2006 results from Hydrolab water quality monitoring probe and field observations:

Sweep	Site ID	Notes
1	1	Pristine/Muddy bottom/Abundance of plant and insect life
1	2	Oil/Sedimented/Plants rebounding on the bank/Tadpole?
1	3	Rocky brook/Lilies and aquatic insects
1	4	Swimming pool cemented into river/Outflow dammed/Rocky bottom/Some garbage
1	5	Oil trace/Water v.clear/Rocky Bottom
1	6	Trout/Metallic debris/Far bank sedimented
1	7	Clear water
1	8	Abundance of ducks
2	1	White film at pond edge/Abundance of aquatic life
2	2	V.shallow/Much sediment/Plant life on fringe/Oil?
2	3	Lots of aquatic life
2	4	Presence of aquatic plants
2	5	Trash present
2	6	Previous garbage removed/small plant fringe
2	7	Orange deposit on banks
2	8	Lots of ducks
3	1	Aquatic life
3	2	Much oil upstream (blackish water)/V. mucky/Aquatic life
3	3	N
3	4	Many broken bottles/water level higher (over weir)
3	5	N
3	6	N
3	7	N
3	8	Many ducks (perhaps contribute to high E. coli?)
4	1	N
4	2	Fairly clear water
4	3	N
4	4	N
4	5	N
4	6	N
4	7	N
4	8	The ducks don't look very healthy/Ragged ducks

2007 results from Hydrolab water quality monitoring probe and field observations:

Sweep	Site ID	River	Rain Event	Site Location	Time	Date
1	1	Nut Brook	N? (1.6mm)	Headwaters	9.55 AM	**7/24/2007**
1	2	Nut Brook	N? (1.6mm)	Nut Brook Junction	10.55 AM	**7/24/2007**
1	3	Nut Brook	Y (13.2 mm)	Nut Gully	3:20 PM	7/23/2007
1	4	Kelligrews	Y (13.2 mm)	Swimming Hole	2:15 PM	7/23/2007
1	5	Kelligrews	Y (13.2 mm)	Nugent's Field	12:45 PM	7/23/2007
1	6	Kelligrews	Y (13.2 mm)	Red Bridge	12:05 PM	7/23/2007
1	7	Kelligrews	Y (13.2 mm)	Kelliview Trail	11:35 AM	7/23/2007
1	8	Kelligrews	Y (13.2 mm)	Head of Estuary	11:15 AM	7/23/2007

Sweep	Site ID	River	Rain Event	Site Location	Time	Date
2	1	Nut Brook	Y (12.4 mm)	Headwaters	10:10 AM	8/9/2007
2	2	Nut Brook	Y (12.4 mm)	Nut Brook Junction	10:45 AM	8/9/2007
2	3	Nut Brook	Y (27.5 mm)	Nut Gully	3:20 PM	8/8/2007
2	4	Kelligrews	Y (27.5 mm)	Swimming Hole	1:35 PM	8/8/2007
2	5	Kelligrews	Y (27.5 mm)	Nugent's Field	12:05 PM	8/8/2007
2	6	Kelligrews	Y (27.5 mm)	Red Bridge	11:45 AM	8/8/2007
2	7	Kelligrews	Y (27.5 mm)	Kelliview Trail	11:20 AM	8/8/2007
2	8	Kelligrews	Y (27.5 mm)	Head of Estuary	11:00 AM	8/8/2007

Sweep	Site ID	River	Rain Event	Site Location	Time	Date
3	1	Nut Brook	N	Headwaters	3:35 PM	8/28/2007
3	2	Nut Brook	N	Nut Brook Junction	4:25 PM	8/28/2007
3	3	Nut Brook	N	Nut Gully	2:25 PM	8/28/2007
3	4	Kelligrews	N	Swimming Hole	12:30 PM	8/28/2007
3	5	Kelligrews	N	Nugent's Field	11:45 AM	8/28/2007
3	6	Kelligrews	N	Red Bridge	11:10 AM	8/28/2007
3	7	Kelligrews	N	Kelliview Trail	10:45 AM	8/28/2007
3	8	Kelligrews	N	Head of Estuary	10:00 AM	8/28/2007

Sweep	Site ID	River	Rain Event	Site Location	Time	Date
4	1	Nut Brook	N	Headwaters	10:20 AM	9/23/2007
4	2	Nut Brook	N	Nut Brook Junction	11:30AM	9/23/2007
4	3	Nut Brook	N	Nut Gully	3:20 PM	9/22/2007
4	4	Kelligrews	N	Swimming Hole	2:25 PM	9/22/2007
4	5	Kelligrews	N	Nugent's Field	1:30 PM	9/22/2007
4	6	Kelligrews	N	Red Bridge	12:45 PM	9/22/2007
4	7	Kelligrews	N	Kelliview Trail	12:15 PM	9/22/2007
4	8	Kelligrews	N	Head of Estuary	11:30 AM	9/22/2007

2007 results from Hydrolab water quality monitoring probe and field observations (raw data in **bold** indicates an unusual result):

Sweep	Site ID	Sediment	Flow	pH	Conductivity (mS/cm)
1	1	N	Standing	**5.01**	0.031
1	2	N	Poor/Moderate	6.53	0.227
1	3	N	Moderate	6.27	0.245
1	4	N	**Moderate**	6.73	0.128
1	5	N	Good	6.77	0.130
1	6	N	Moderate/Good	6.59	0.145
1	7	N	Good/Fast	6.71	0.155
1	8	N	Moderate/Tidal	6.71	0.170

Sweep	Site ID	Sediment	Flow	pH	Conductivity (mS/cm)
2	1	N	Standing	/	0.027
2	2	N	Poor	6.25	0.114
2	3	N	Moderate	6.32	0.274
2	4	N	**Moderate**	6.75	0.178
2	5	N	Good	6.9	0.167
2	6	N	Moderate/Good	6.6	0.166
2	7	N	Good/Fast	6.93	0.178
2	8	N	Moderate/Tidal	6.65	0.208

Sweep	Site ID	Sediment	Flow	pH	Conductivity (mS/cm)
3	1	Y	Standing	**4.94**	0.034
3	2	Y	Poor	6.61	0.375
3	3	Y	**Low**	6.84	0.456
3	4	Y	**Low**	6.8	0.216
3	5	Y	**Moderate**	7.18	0.210
3	6	Y	**Low**	6.73	0.211
3	7	Y	**Moderate**	7.09	0.227
3	8	Y	Moderate/Tidal	6.88	0.590

Sweep	Site ID	Sediment	Flow	pH	Conductivity (mS/cm)
4	1	Y	Standing	**5.45**	0.040
4	2	Y	**Poor/Near Standing**	7.14	0.451
4	3	Y	Moderate	7.23	**0.688**
4	4	Y	**Moderate**	7.21	0.322
4	5	Y	Good	7.48	0.311
4	6	Y	Moderate/Good	6.68	0.292
4	7	Y	Good/Fast	7.23	0.294
4	8	Y	Moderate/Tidal	6.84	0.321

2007 results from Hydrolab water quality monitoring probe and field observations (raw data in **bold** indicates an unusual result):

Sweep	Site ID	DO (mg/L)	ORP (mV)	Temperature ('C)	Salinity (PSU)	TDS (g/L)
1	1	6.85	469	19.13	0.02	0.0
1	2	6.89	342	17.16	0.11	0.2
1	3	8.12	365	**22.76**	0.12	0.2
1	4	8.27	351	21.98	0.06	0.1
1	5	8.52	347	19.95	0.06	0.1
1	6	9.22	322	19.21	0.07	0.1
1	7	9.20	346	18.07	0.07	0.1
1	8	9.14	352	18.26	0.08	0.1

Sweep	Site ID	DO (mg/L)	ORP (mV)	Temperature ('C)	Salinity (PSU)	TDS (g/L)
2	1	6.94	483	20.17	0.02	0.0
2	2	7.03	359	17.58	0.06	0.1
2	3	7.65	351	**23.75**	0.13	0.2
2	4	8.17	337	20.68	0.09	0.1
2	5	8.31	338	18.73	0.08	0.1
2	6	8.00	341	17.64	0.08	0.1
2	7	9.41	317	17.41	0.09	0.1
2	8	8.85	348	17.81	0.10	0.1

Sweep	Site ID	DO (mg/L)	ORP (mV)	Temperature ('C)	Salinity (PSU)	TDS (g/L)
3	1	9.06	487	**26.11**	0.02	0.0
3	2	**5.35**	328	17.31	0.18	0.2
3	3	7.58	355	**23.95**	0.22	0.3
3	4	9.23	304	16.69	0.10	0.1
3	5	9.60	343	16.38	0.10	0.1
3	6	8.86	352	16.36	0.10	0.1
3	7	9.99	318	15.14	0.11	0.2
3	8	9.62	348	15.27	0.28	0.4

Sweep	Site ID	DO (mg/L)	ORP (mV)	Temperature ('C)	Salinity (PSU)	TDS (g/L)
4	1	**5.73**	448	15.95	0.02	0.0
4	2	6.72	332	13.80	0.22	0.3
4	3	7.24	463	20.29	0.34	0.4
4	4	8.14	360	16.50	0.15	0.2
4	5	10.47	362	14.83	0.15	0.2
4	6	9.44	349	14.14	0.14	0.2
4	7	10.28	348	13.97	0.14	0.2
4	8	10.67	368	14.27	0.15	0.2

2007 results from Hydrolab water quality monitoring probe and field observations:

Sweep	Site ID	Replicates	Notes
1	1	D/Nutrients	high water level/frogs
1	2	N	Really overgrown
1	3	N	raised water level/yellow water
1	4	N	increased flow/yellow water
1	5	D/Solids	increased flow/yellow water
1	6	T/Micro	v. silty water/yellow water
1	7	D/Metals	increased flow/yellow water
1	8	N	yellow water

Sweep	Site ID	Replicates	Notes
2	1	N	
2	2	D/Metals	very flooded
2	3	D/Solids	
2	4	D/Nutrients	high water level
2	5	N	new sediment deposit on banks
2	6	N	
2	7	N	high water
2	8	T/Micro	

Sweep	Site ID	Replicates	Notes
3	1	N	Sunny
3	2	N	low water/muddy/silty
3	3	N	heavy siltation/brown water/low level
3	4	T/Micro	heavy silt
3	5	D/Nutrients	heavy silt/lower water level
3	6	D/Sediment	heavy silt
3	7	D/Metals	brown water/heavy sedimentation
3	8	N	heavy silt action event

Sweep	Site ID	Replicates	Notes
4	1	N	low water level
4	2	N	trace oil/v.low water level/unusual algae
4	3	D/Metals	v. low water level
4	4	D/Nutrients	v. low water level/flow through exposed culvert
4	5	D/Solids	grassy patches on streambank/surviving plantlings
4	6	D/Sediment	
4	7	N	yard clippings dumped
4	8	T/Micro	lots of ducks/water cleared up

2006 results for Total Solids testing (including Total Suspended and Dissolved Solids and Volatile Organic Content) (raw data in **bold** indicates an unusual result):

Sweep 1

Sample ID	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
1	26	58	84	44
2	40	292	332	96
3	20	402	422	140
4a	14	204	218	80
4b	18	200	218	76
5	14	182	196	58
6	12	186	198	84
7	4	184	188	70
8	12	840	**852**	**266**
Blank	0	10	10	0

Sweep 2

Sample ID	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
1	4	44	48	30
2	12	398	410	58
3	12	370	382	82
4	18	174	192	66
5a	0	178	178	62
5b	0	174	174	52
6	2	170	172	54
7	4	182	186	62
8	2	184	186	64
Blank	0	0	0	0

Sweep 3

Sample ID	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
1	2	80	82	74
2	12	258	270	82
3	2	260	262	76
4	2	140	142	70
5	0	134	134	68
6a	6	130	136	60
6b	10	130	140	60
7	2	136	138	68
8	4	160	164	64
Blank	0	0	0	0

2006 results for Total Solids testing (including Total Suspended and Dissolved Solids and Volatile Organic Content):

Sweep 4

Sample ID	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
1	10	64	74	62
2	76	244	320	88
3a	2	340	342	76
3b	2	340	342	90
4	6	210	216	112
5	4	206	210	66
6	2	190	190	58
7	4	198	202	68
8	4	262	266	58
Blank	0	0	0	0

Means

ID	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
1	10.5	61.5	69.5	52.5
2	35	298	314	81
3	9	343	352	95.3
4	10.5	181.5	192	81.5
5	4.5	174.5	179	62.3
6	6	169	174.5	64
7	3.5	175	178.5	67
8	5.5	361.5	367	113

2007 results for Total Solids testing (including Total Suspended and Dissolved Solids and Volatile Organic Content):

Nut Brook/Kelligrews River sampling solids testing results, 2007

Sweep/Date	ID	Location	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
Sweep1/July 31st, 2007	1	NB	2	68	70	30
	2	NB	20	178	198	42
	3	NB	2	194	196	46
	4	KR	0	120	120	32
	5	KR	2	118	120	34
	5	KR	0	120	120	34
	6	KR	0	128	128	28
	7	KR	0	126	126	28
	8	KR	0	140	140	30
	Blank	KR	0	0	0	0

2007 results for Total Solids testing (including Total Suspended and Dissolved Solids and Volatile Organic Content):

Nut Brook/Kelligrews River sampling solids testing results, 2007

Sweep/Date	ID	Location	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
Sweep 2 August 8th, 2007	1	NB	0	62	62	34
	2	NB	16	138	154	52
	3	NB	6	202	208	46
	3	NB	4	198	202	34
	4	KR	0	130	130	36
	5	KR	0	132	132	40
	6	KR	4	124	128	32
	7	KR	0	130	130	30
	8	KR	0	154	154	26
	Blank	KR	0	2	2	0

Sweep/Date	ID	Location	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
Sweep 3 August 28th, 2007	1	NB	2	92	94	50
	2	NB	90	270	360	44
	3	NB	146	346	492	32
	4	NB	4	238	242	32
	4	KR	2	246	248	32
	5	KR	2	222	224	30
	6	KR	2	196	200	26
	7	KR	2	200	204	20
	8	KR	2	412	416	46
	Blank	KR	0	6	6	0

Sweep/Date	ID	Location	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
Sweep 4 Sept 22nd, 2007	1	NB	6	58	64	70
	2	NB	12	318	330	78
	3	NB	4	412	416	58
	4	NB	0	208	208	52
	5	KR	2	194	196	62
	5	KR	4	190	194	54
	6	KR	6	184	190	52
	7	KR	2	186	188	46
	8	KR	4	198	202	54
	Blank	KR	0	2	2	0

2007 results for Total Solids testing (including Total Suspended and Dissolved Solids and Volatile Organic Content):

Means

ID	TSS (mg/L)	TDS (mg/L)	TS (mg/L)	VOC (mg/L)
1	2.5	70	72.5	46
2	34.5	226	260.5	54
3	39.3	288	346.3	44
4	0.8	175	175.8	39.5
5	1.5	166.3	167.8	40.5
6	4.5	158	161.5	34.5
7	1	160.5	162	31
8	1.5	226	228	39

2006 results for Nutrients:

Client Remarks	Sample Date	CARBON, TOTAL ORGANIC (N0N PURG) MG/L WATER	PHOSPHOROUS MG/L WATER
(SWEEP 1) _1	8/1/2006 10:30	12.8	0.008
(SWEEP 1) _2	8/1/2006 11:05	8.3	0.031
(SWEEP 1) _3	8/1/2006 11:45	7.4	0.026
(SWEEP 1) _4	8/1/2006 11:40	7.0	0.013
(SWEEP 1) _5	8/1/2006 11:45	6.0	0.008
(SWEEP 1) _6	8/1/2006 12:05	5.2	0.012
(SWEEP 1) _6	8/1/2006 12:06	5.2	0.013
(SWEEP 1) _7	8/1/2006 12:25	4.7	0.006
(SWEEP 1) _8	8/1/2006 12:35	4.5	0.008
SWEEP 2, _1	8/8/2006 12:00	13.6	0.013
SWEEP 2, _2	8/8/2006 12:00	6.7	0.082
SWEEP 2, _3	8/8/2006 12:00	7.4	0.031
SWEEP 2, _4	8/8/2006 12:00	7.6	0.043
SWEEP 2, _5	8/8/2006 12:00	8.3	0.012
SWEEP 2, _6	8/8/2006 12:00	5.4	0.009
SWEEP 2, _6	8/8/2006 12:00	5.6	0.01
SWEEP 2, _7	8/8/2006 12:00	4.4	0.012
SWEEP 2, _8	8/8/2006 12:00	4.8	0.017
SWEEP # 3_1	8/21/2006 12:00	24.7	0.012
SWEEP # 3_2	8/21/2006 12:00	12.5	0.069
SWEEP # 3_3	8/21/2006 12:00	10.4	0.022
SWEEP # 3_4	8/21/2006 12:00	10.3	0.011
SWEEP # 3_5	8/21/2006 12:00	8.8	0.009
SWEEP # 3_5	8/21/2006 12:00	8.8	0.01
SWEEP # 3_6	8/21/2006 12:00	7.2	0.01
SWEEP # 3_7	8/21/2006 12:00	6.4	0.007
SWEEP # 3_8	8/21/2006 12:00	5.9	0.011
SWEEP # 4_1	9/5/2006 12:00	18.7	0.012
SWEEP # 4_2	9/5/2006 12:00	8.4	0.098
SWEEP # 4_2	9/5/2006 12:00	8.5	0.103
SWEEP # 4_3	9/5/2006 12:00	8.3	0.022
SWEEP # 4_4	9/5/2006 12:00	7.0	0.007
SWEEP # 4_5	9/5/2006 12:00	6.5	0.007
SWEEP # 4_6	9/5/2006 12:00	5.3	0.007
SWEEP # 4_7	9/5/2006 12:00	5.0	0.005
SWEEP # 4_8	9/5/2006 12:00	4.7	0.007

2006 results for Nutrients (raw data in **bold** indicates an unusual result):

Client Remarks	NITROGEN, AMMONIA MG/L WATER	NITROGEN TOTAL MG/L WATER
(SWEEP 1) _1	**0.023**	0.72
(SWEEP 1) _2	**0.126**	1.04
(SWEEP 1) _3	**0.142**	1.25
(SWEEP 1) _4	**0.04**	0.73
(SWEEP 1) _5	**0.023**	0.62
(SWEEP 1) _6	**0.043**	0.69
(SWEEP 1) _6	**0.032**	0.72
(SWEEP 1) _7	**0.031**	0.56
(SWEEP 1) _8	**0.043**	0.63
SWEEP 2 _1	**0.03**	1.01
SWEEP 2 _2	**0.076**	1.42
SWEEP 2 _3	**0.041**	1.40
SWEEP 2 _4	**0.03**	1.27
SWEEP 2 _5	**0.054**	1.67
SWEEP 2 _6	**0.036**	0.95
SWEEP 2 _6	**0.035**	0.93
SWEEP 2 _7	**0.039**	0.67
SWEEP 2 _8	**0.041**	1.00
SWEEP # 3_1	**0.042**	0.84
SWEEP # 3_2	**0.276**	1.21
SWEEP # 3_3	**0.195**	1.85
SWEEP # 3_4	**0.028**	0.63
SWEEP # 3_5	**0.024**	0.56
SWEEP # 3_5	**0.025**	0.62
SWEEP # 3_6	**0.031**	0.67
SWEEP # 3_7	**0.022**	0.68
SWEEP # 3_8	**0.031**	0.66
SWEEP # 4_1	**0.033**	0.70
SWEEP # 4_2	**0.197**	1.23
SWEEP # 4_2	**0.181**	1.20
SWEEP # 4_3	**0.076**	3.31
SWEEP # 4_4	**0.03**	1.66
SWEEP # 4_5	**0.029**	1.70
SWEEP # 4_6	**0.038**	1.52
SWEEP # 4_7	**0.038**	1.49
SWEEP # 4_8	**0.044**	1.38

2007 results for Nutrients (raw data in **bold** indicates an unusual result):

Date	Sample ID	Total Organic Carbon (mg/L)	Ammonia N (mg/L)	Total Nitrogen (mg/L)
Sweep 1 July 25th, 2007	**1**	16.6	0.017	0.54
	1	17.7	0.016	0.47
	2	14.8	**0.167**	0.73
	3	18.2	**0.033**	0.69
	4	16.0	0.011	0.59
	5	14.5	0.010	0.59
	6	13.3	0.013	0.50
	7	12.8	0.009	0.59
	8	11.8	0.013	0.72

Date	Sample ID	Total Organic Carbon (mg/L)	Ammonia N (mg/L)	Total Nitrogen (mg/L)
Sweep 2 Aug 8th, 2007	1	21.0	0.009	0.22
	2	21.5	**0.097**	0.64
	3	10.8	**0.024**	**1.11**
	4	10.2	0.016	0.77
	4	10.1	0.008	0.66
	5	9.1	0.015	0.68
	6	7.2	0.009	0.68
	7	6.5	0.013	0.71
	8	5.6	0.013	0.71

Date	Sample ID	Total Organic Carbon (mg/L)	Ammonia N (mg/L)	Total Nitrogen (mg/L)
Sweep 3 Aug 28th, 2007	1	25.9	<0.002	0.57
	2	11.5	**0.429**	**1.09**
	3	10.2	**0.088**	**1.03**
	4	8.8	0.004	0.62
	5	7.1	<0.002	0.64
	6	6.7	0.004	0.71
	6	6.1	0.008	0.91
	7	5.1	0.004	**0.98**
	8	4.7	0.011	**2.57**

Date	Sample ID	Total Organic Carbon (mg/L)	Ammonia N (mg/L)	Total Nitrogen (mg/L)
Sweep 4 Sept 11th, 2007	1	5.8	**0.018**	0.71
	2	6.2	**0.049**	0.8
	3	19.5	**0.024**	0.55
	4	5	0.011	0.5
	4	5	0.011	0.56
	5	3.9	0.014	0.87
	6	3.1	**0.023**	**1.1**
	7	3	**0.019**	**1.9**
	8	2.6	**0.019**	**4.84**

2007 results for Nutrients (raw data in **bold** indicates an unusual result):

Date	Sample ID	Phosphorus (mg/L)
Sweep 1 July 25th, 2007	**1**	0.012
	1	0.010
	2	0.099
	3	0.049
	4	0.037
	5	0.027
	6	0.036
	7	0.029
	8	0.020

Date	Sample ID	Phosphorus (mg/L)
Sweep 2 Aug 8th, 2007	1	0.009
	2	0.084
	3	0.058
	4	0.022
	4	0.019
	5	0.016
	6	0.019
	7	0.013
	8	0.013

Date	Sample ID	Phosphorus (mg/L)	***Nitrate N (mg/L)***
Sweep 3 Aug 28th, 2007	1	0.011	0.07
	2	0.19	0.18
	3	**0.168**	0.46
	4	0.106	0.33
	5	0.06	0.39
	6	0.067	0.45
	6	0.063	0.62
	7	0.042	<0.10
	8	0.049	**2.2**

Date	Sample ID	Phosphorus (mg/L)
Sweep 4 Sept 11th, 2007	1	0.008
	2	0.043
	3	0.01
	4	0.006
	4	0.006
	5	0.005
	6	0.008
	7	0.004
	8	0.005

2006 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result) (A strikethrough is for information not to be used):

Sample	Date	~~Li 6 (ppb)~~	Li 7 (ppb)	Be (ppb)	B (ppb)	Mg (ppb)	Al (ppb)
NB1	7/25/2006	~~<2.49~~	0.22	1.01	51.88	565.6	188.6
	8/8/2006	~~0.31~~	0.29	<0.05	7.90	470.7	133.9
	8/21/2006	~~<0.50~~	<0.40	<0.07	6.32	572.0	462.6
	9/5/2006	~~<0.25~~	0.23	<0.05	7.82	582.2	506.9
	Mean	~~0.48~~	0.24	0.27	18.48	547.6	**323.0**
NB2	7/25/2006	~~<2.20~~	0.19	<0.73	154.18	2869.2	125.2
	8/8/2006	~~0.26~~	0.38	0.26	168.63	5035.1	89.8
	8/21/2006	~~1.48~~	1.92	0.30	142.78	4424.8	162.9
	9/5/2006	~~0.34~~	0.40	0.14	131.97	3823.3	346.7
	Mean	~~0.80~~	0.72	0.27	**149.39**	**4038.1**	**181.2**
NB3	7/25/2006	~~<2.20~~	0.33	<0.73	98.59	3189.9	35.0
	8/8/2006	~~0.36~~	0.47	0.06	35.61	2392.9	59.4
	8/21/2006	~~<0.49~~	<0.51	<0.07	32.15	1777.7	70.9
	9/5/2006	~~0.40~~	0.46	<0.05	27.49	1852.5	73.5
	Mean	~~0.53~~	0.38	0.12	48.46	2303.2	59.7
KR4	7/25/2006	~~<2.54~~	0.26	<0.85	43.76	1731.4	45.2
	8/8/2006	~~0.47~~	0.55	<0.05	16.81	1484.8	161.4
	8/21/2006	~~<0.53~~	<0.43	<0.08	15.66	1167.1	74.5
	9/5/2006	~~0.39~~	0.55	<0.05	16.24	1326.0	118.0
	Mean	~~0.62~~	0.36	0.13	23.12	1427.3	99.8
KR5	7/25/2006	~~<2.23~~	0.47	<0.74	50.87	1571.6	43.2
	8/8/2006	~~0.61~~	0.65	<0.06	14.53	1558.1	27.6
	8/21/2006	~~<0.56~~	0.59	<0.08	14.70	1248.6	68.4
	9/5/2006	~~0.45~~	0.52	<0.06	20.01	1488.6	43.1
	Mean	~~0.61~~	0.56	0.12	25.03	1466.7	45.6
KR6	7/25/2006	~~<2.44~~	1.15	<0.81	26.74	1976.5	34.0
	8/8/2006	~~0.91~~	0.95	<0.05	15.92	1873.0	27.4
	8/21/2006	~~0.86~~	1.11	<0.08	14.39	1728.8	59.2
	9/5/2006	~~0.84~~	0.85	<0.05	15.86	1872.6	31.3
	Mean	~~0.96~~	1.02	0.12	18.23	1862.7	38.0
KR7	7/25/2006	~~<2.28~~	1.42	<0.76	26.83	2412.9	28.0
	8/8/2006	~~1.40~~	1.48	<0.07	15.01	2389.2	18.5
	8/21/2006	~~1.25~~	1.55	<0.08	13.30	2073.3	37.3
	9/5/2006	~~1.32~~	1.35	<0.05	15.78	2352.8	26.6
	Mean	~~1.30~~	1.45	0.12	17.73	2307.0	27.6
KR8	7/25/2006	~~<2.42~~	3.30	<0.81	97.33	10723.9	35.4
	8/8/2006	~~1.77~~	1.80	<0.06	17.28	2927.5	48.8
	8/21/2006	~~1.70~~	2.08	<0.07	14.72	2794.1	47.8
	9/5/2006	~~1.68~~	1.80	<0.05	21.77	2389.4	30.9
	Mean	~~1.59~~	2.25	0.12	37.78	**4708.7**	40.7

2006 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result) (A strikethrough is for information not to be used):

Sample	Si (ppb)	P (ppb)	S (ppb)	Cl (ppb)	~~Ca 42 (ppb)~~	Ca 43 (ppb)	Ti (ppb)
	313	<4581	<138883	10240	~~<4028~~	886	<1.40
NB1	121	<2028	<8398	10766	~~<1304~~	1005	0.63
	270	<2009	118518	4399.5	~~<3899~~	637	1.55
	1181	<115	<2199	6097.5	~~<1394~~	715	1.93
	471	1092	48315	7876	~~1328~~	811	1.20
	3181	<4037	<122371	59165	~~24566~~	29470	11.38
NB2	1661	<2198	33350	65679	~~33984~~	35159	3.57
	3300	<2933	222342	39543	~~25209~~	24755	4.70
	2845	<119	17714	36789	~~24384~~	26117	6.84
	2746	1161	83648	50294	~~27036~~	**28875**	6.63
	1610	<4051	<122807	237479	~~15951~~	18241	5.98
NB3	995	<2001	<8288	247972	~~13462~~	14618	1.87
	1999	<2000	192171	92078.0	~~8875~~	9946	2.41
	1634	<108	<2070	138010	~~9608~~	10875	1.57
	1559	1020	64688	**178885**	~~11974~~	13420	2.96
	2030	<4671	<141615	106646	~~6574~~	9169	1.52
KR4	1166	<1906	<7893	107697	~~7287~~	7859	1.49
	2062	<2146	93894	36892	~~<4166~~	5586	1.33
	1614	<117	93894	72294	~~7287~~	6722	1.41
	1718	1105	42923	80882	~~5755~~	7334	1.44
	2230	<4108	<124524	90735	~~8004~~	9827	1.88
KR5	1291	<2204	<9127	101238	~~6936~~	9207	0.65
	2273	<2281	226127	33641	~~5003~~	7198	1.16
	1833	<131	<2503	75876	~~6999~~	8736	0.79
	1907	1091	73551	75372	~~6735~~	8742	1.12
	2532	<4491	<136135	77380	~~9229~~	11406	1.71
KR6	1389	<1892	<7836	92433	~~8651~~	10527	0.74
	2686	<2182	-223669	33511	~~7090~~	9230	1.23
	2088	<105	3762	73380	~~9886~~	10573	0.79
	2174	1084	46896	69176	~~8714~~	10434	1.12
	2701	<4183	<126810	75052	~~9380~~	12001	2.09
KR7	1481	<2529	<10474	94648	~~9820~~	11592	0.78
	2769	<2137	-302928	33558	~~<4148~~	9770	1.23
	2287	<103	3185	72654	~~10803~~	11564	0.85
	2310	1119	55823	68978	~~8019~~	11232	1.24
	2994	<4443	<134693	319981	~~13803~~	17025	9.47
KR8	1550	<2181	<9033	108978	~~11283~~	11926	0.99
	2985	<1974	-155545	44387	~~6243~~	10257	1.56
	2277	<103	<1965	95861	~~9941~~	11697	0.92
	2452	1088	37655	**142302**	~~10318~~	12726	3.24

2006 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result):

Sample	V (ppb)	Cr 52 (ppb)	Cr 53 (ppb)	Fe 54 (ppb)	Mn (ppb)	Fe 56 (ppb)	Fe 57 (ppb)
NB1	1.40	0.71	0.98	201	10.96	438	203
	0.41	0.31	0.30	124	5.76	383	146
	0.67	0.42	0.77	355	31.55	469	406
	1.34	<0.34	0.59	376	18.36	407	387
	0.96	0.40	0.66	264	16.66	**424**	285
NB2	0.30	0.37	0.94	560	471.23	488	599
	<0.39	0.31	<0.63	558	457.31	1014	566
	0.91	0.39	1.19	773	878.13	667	772
	1.06	<0.35	1.22	**2051**	730.77	**2027**	**2019**
	0.62	0.31	0.92	**986**	**634.36**	**1049**	**989**
NB3	<0.26	0.33	<1.11	159	354.60	451	205
	<0.72	<0.08	<2.19	345	221.49	746	356
	0.57	<0.12	<0.74	326	335.03	368	349
	0.83	<0.32	1.35	329	207.43	315	332
	0.47	0.15	0.84	290	279.64	**470**	310
KR4	<0.15	0.51	<1.00	<90	53.14	340	174
	0.94	<0.08	<0.98	567	266.65	474	579
	0.57	<0.13	0.85	195	27.38	299	243
	0.75	<0.34	0.87	381	147.02	387	411
	0.55	0.20	0.68	241	123.55	375	352
KR5	0.16	0.37	<0.87	138	50.31	275	130
	<0.46	<0.09	<0.94	<99	29.72	<191	68
	0.49	<0.13	0.57	136	33.88	244	178
	0.53	<0.38	0.75	115	40.07	123	113
	0.35	0.17	0.56	110	38.50	184	122
KR6	<0.12	0.39	<0.92	220	100.90	442	215
	<0.41	<0.08	<0.85	91	64.74	220	109
	0.49	0.14	0.77	256	132.26	320	284
	0.47	<0.31	0.70	135	49.68	123	140
	0.31	0.18	0.59	175	86.89	276	187
KR7	<0.11	0.29	<0.86	213	150.19	521	238
	<0.48	0.11	<0.90	196	138.48	436	215
	0.39	0.14	0.74	236	135.99	294	263
	0.46	<0.30	0.99	197	129.55	178	183
	0.29	0.17	0.43	210	138.55	357	225
KR8	0.59	0.42	<1.31	209	216.23	577	253
	<0.47	<0.09	<0.98	346	157.35	769	677
	0.38	<0.13	0.83	272	197.24	289	282
	0.51	<0.30	1.05	215	126.81	210	210
	0.43	0.17	0.76	261	174.41	**461**	356

2006 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result):

Sample	Co (ppb)	Ni (ppb)	Cu (ppb)	Zn (ppb)	As (ppb)	Br (ppb)	Se (ppb)
	<0.11	1.77	**13.51**	60.28	<0.80	<702.29	<4.70
NB1	0.05	<3.02	<1.62	35.26	<0.17	<66.75	<0.66
	0.21	1.77	1.44	20.91	0.12	<96.49	<0.66
	0.12	<1.35	<1.31	28.45	<0.32	<47.84	<3.02
	0.11	1.43	**4.10**	**36.22**	0.19	114.17	1.13
	<0.22	<1.23	0.70	34.00	<0.72	<618.79	<4.08
NB2	0.13	<3.27	<1.75	<17.79	<0.20	87.86	<0.78
	0.34	1.87	1.52	18.61	0.26	<140.88	<1.01
	0.35	1.66	4.67	36.24	<0.33	71.36	<3.10
	0.23	1.45	1.94	24.44	0.22	134.76	1.12
	<0.17	<1.24	1.26	27.64	<0.79	<620.99	<4.23
NB3	0.11	<2.98	<1.60	19.79	<0.22	87.43	<0.72
	0.11	1.76	1.19	26.13	0.12	<96.04	<0.69
	0.09	<1.27	<1.24	24.18	<0.30	63.37	<2.83
	0.10	1.13	0.97	24.43	0.19	127.33	1.06
	<0.13	1.55	4.38	43.85	<0.85	<716.10	<4.75
KR4	0.28	<2.84	<1.52	17.28	<0.18	63.03	<0.65
	0.04	0.85	0.60	11.69	0.10	<103.08	<0.74
	0.04	<1.37	<1.34	14.48	<0.33	63.03	<3.07
	0.11	1.13	1.60	21.82	0.20	134.04	1.15
	<0.13	<1.25	1.04	22.49	<0.75	<629.68	<4.28
KR5	0.02	<3.28	2.06	<17.84	<0.21	<72.54	<0.72
	0.03	0.97	0.66	26.03	0.10	<109.53	<0.79
	0.02	<1.53	<1.49	15.85	<0.37	61.08	<3.43
	0.03	1.00	1.13	18.32	0.19	116.74	1.15
	<0.14	<1.37	0.52	26.56	<0.81	<688.39	<4.66
KR6	0.04	<2.82	<1.51	<15.32	<0.18	<62.28	<0.62
	0.09	1.79	1.12	38.80	0.14	<104.78	<0.75
	0.02	<1.22	<1.19	19.81	<0.29	64.54	<2.74
	0.06	1.12	0.75	23.21	0.20	123.07	1.10
	<0.14	1.40	1.82	16.22	<0.75	<641.24	<4.33
KR7	0.05	<3.77	<2.02	21.23	<0.23	<83.25	<0.81
	0.07	1.64	0.49	14.29	0.16	<102.65	<0.74
	0.07	1.22	<1.18	17.68	<0.29	65.55	<2.69
	0.07	1.54	0.98	17.35	0.20	119.75	1.07
	<0.17	<1.36	1.15	20.13	<0.89	**1018.26**	<5.05
KR8	0.15	<3.25	<1.74	<17.66	<0.21	<71.80	<0.74
	0.17	1.80	0.82	16.66	0.15	<94.80	<0.69
	0.10	2.58	<1.17	28.24	<0.29	130.91	<2.68
	0.13	1.67	0.86	18.47	0.21	**308.12**	1.15

2006 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result):

Sample	Rb (ppb)	Sr (ppb)	Mo (ppb)	Ag (ppb)	Cd (ppb)	Sn (ppb)	Sb (ppb)
NB1	<0.46	7	<0.13	<0.04	<0.59	0.51	<0.21
	0.52	6	<0.05	<0.01	<0.10	0.40	0.23
	0.26	6	<0.02	<0.01	<0.05	0.21	0.04
	0.34	6	0.04	<0.01	<0.17	0.18	<0.05
	0.34	6	0.04	0.01	0.11	0.33	0.10
NB2	4.47	**112**	<0.11	<0.03	<0.52	0.49	<0.19
	4.98	**127**	0.21	<0.01	<0.11	0.12	0.08
	4.71	89	0.35	<0.02	<0.07	0.09	0.11
	4.10	96	0.17	<0.01	<0.17	0.19	0.09
	4.56	**106**	0.20	0.01	0.11	0.22	0.09
NB3	2.97	60	0.25	<0.03	<0.52	0.48	<0.19
	2.49	51	0.18	<0.01	<0.10	0.15	0.05
	2.26	36	0.27	<0.01	<0.05	0.09	0.04
	1.99	39	0.13	<0.01	<0.16	0.12	<0.05
	2.43	47	0.21	0.01	0.10	0.21	0.05
KR4	2.09	32	<0.13	<0.04	<0.60	1.11	<0.21
	1.66	28	0.11	<0.01	<0.10	0.24	0.10
	1.06	20	0.13	<0.01	<0.05	0.05	0.03
	1.36	29	0.12	0.12	<0.17	0.08	<0.05
	1.54	27	0.10	0.04	0.12	0.37	0.07
KR5	1.71	32	<0.12	<0.03	<0.53	0.99	<0.19
	1.54	30	0.12	<0.01	<0.11	0.14	0.09
	1.06	23	0.13	<0.01	<0.05	0.09	0.02
	1.32	30	0.08	<0.02	<0.19	<0.07	<0.06
	1.41	29	0.10	0.01	0.11	0.31	0.06
KR6	1.30	42	<0.13	<0.04	<0.58	1.11	<0.21
	1.52	38	0.12	<0.01	<0.10	0.17	0.09
	1.09	37	0.12	<0.01	<0.05	0.12	0.04
	1.38	39	0.09	<0.01	<0.15	0.14	<0.05
	1.32	39	0.10	0.01	0.11	0.39	0.07
KR7	1.30	48	<0.12	<0.03	<0.54	0.99	<0.19
	1.35	46	0.10	<0.01	<0.13	0.15	<0.05
	1.06	40	0.10	<0.01	<0.05	<0.03	0.01
	1.52	46	0.08	<0.01	<0.15	0.15	<0.04
	1.30	45	0.09	0.01	0.11	0.33	0.04
KR8	3.25	**150**	<0.13	<0.04	<0.57	0.38	<0.20
	1.61	53	0.15	<0.01	<0.11	0.22	0.06
	1.25	48	0.13	<0.01	<0.05	0.07	0.05
	1.73	60	0.13	<0.01	<0.15	0.14	<0.04
	1.96	**78**	0.12	0.01	0.11	0.20	0.06

2006 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result):

Sample	I (ppb)	Cs (ppb)	Ba (ppb)	La (ppb)	Ce (ppb)	Hg (ppb)	Tl (ppb)	Pb (ppb)	Bi (ppb)	U (ppb)
NB1	5.58	<0.13	5.38	0.26	0.49	<0.34	<0.16	0.80	<0.03	0.06
	4.80	<0.01	7.96	0.25	0.46	<0.03	<0.01	<0.56	<0.01	0.08
	3.05	<0.01	11.03	0.60	1.14	<0.12	<0.02	0.54	<0.01	0.14
	4.38	<0.05	8.94	0.75	1.42	<0.04	<0.10	0.70	<0.02	0.16
	4.45	0.03	8.33	0.47	0.88	0.07	0.04	0.58	0.01	0.11
NB2	29.04	<0.12	47.87	0.31	0.78	<0.30	0.30	0.48	<0.03	2.39
	25.94	0.11	36.37	0.28	0.69	<0.03	<0.01	<0.61	<0.01	2.67
	48.13	0.10	36.36	0.64	1.23	<0.17	0.12	0.69	<0.02	2.46
	20.42	0.14	44.74	1.00	2.55	<0.04	<0.11	1.76	<0.02	1.99
	30.88	0.10	41.33	0.56	1.31	0.07	0.12	0.81	0.01	**2.38**
NB3	20.68	<0.12	21.22	0.14	0.25	<0.30	0.50	0.17	<0.03	0.41
	16.50	0.12	24.20	0.24	0.42	<0.03	<0.01	<0.56	<0.01	0.55
	12.78	0.11	18.79	0.39	0.49	<0.12	0.18	0.28	<0.01	1.03
	10.86	0.19	29.39	0.32	0.44	<0.04	0.15	0.57	<0.02	1.03
	15.20	0.12	23.40	0.27	0.40	0.06	0.21	0.33	0.01	0.75
KR4	12.08	<0.14	23.06	0.10	0.19	<0.35	0.39	0.24	<0.04	0.18
	9.99	0.05	25.90	0.52	1.19	<0.03	<0.01	1.11	<0.01	0.40
	7.52	0.04	16.71	0.27	0.32	<0.12	0.09	0.14	<0.01	0.51
	8.76	0.05	21.31	0.14	0.18	<0.04	<0.11	0.15	<0.02	0.31
	9.59	0.07	21.74	0.26	0.47	0.07	0.14	0.41	0.01	0.35
KR5	11.83	<0.12	26.67	0.09	0.18	<0.30	0.35	0.25	<0.03	0.19
	9.61	0.04	23.47	0.07	0.12	<0.03	<0.01	<0.61	<0.01	0.18
	6.65	0.03	22.16	0.21	0.27	<0.13	0.08	0.19	<0.01	0.46
	7.23	0.09	26.51	0.13	0.21	<0.05	<0.12	<0.15	<0.03	0.28
	8.83	0.06	24.70	0.13	0.19	0.06	0.12	0.21	0.01	0.28
KR6	11.20	<0.13	35.54	0.10	0.13	<0.33	0.33	0.19	<0.03	0.18
	9.38	0.04	30.96	0.07	0.12	<0.03	<0.01	<0.53	<0.01	0.16
	7.42	0.03	31.02	0.20	0.28	<0.13	0.09	0.25	<0.01	0.37
	7.53	0.08	34.09	0.11	0.15	<0.04	<0.09	0.24	<0.02	0.23
	8.88	0.05	32.90	0.12	0.17	0.07	0.12	0.24	0.01	0.23
KR7	11.90	<0.12	33.77	0.05	0.09	<0.31	0.30	0.36	<0.03	0.12
	10.40	0.04	31.36	0.07	0.08	<0.04	<0.01	<0.70	<0.01	0.12
	7.06	0.03	29.02	0.12	0.14	<0.12	0.09	<0.13	<0.01	0.27
	8.47	0.08	35.28	0.08	0.10	<0.04	<0.09	<0.12	<0.02	0.18
	9.46	0.05	32.36	0.08	0.10	0.06	0.11	0.21	0.01	0.17
KR8	12.68	<0.13	39.58	0.08	0.13	<0.33	0.50	0.43	<0.03	0.14
	9.77	0.03	31.22	0.13	0.20	<0.03	<0.01	<0.61	<0.01	0.14
	7.56	0.03	31.16	0.14	0.21	<0.11	0.10	0.29	<0.01	0.23
	8.11	0.07	33.75	0.08	0.13	<0.04	<0.09	0.50	<0.02	0.16
	9.53	0.05	33.93	0.11	0.17	0.06	0.16	0.38	0.01	0.17

2007 results for Metals (“<” indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result) (A strikethrough is for information not to be used):

Sample	Date	~~Li 6 (ppb)~~	Li 7 (ppb)	Be (ppb)	B (ppb)	Mg (ppb)	Al (ppb)
NB1	**7/23/2007**	~~<0.92~~	0.28	<0.45	4.37	475.2	**485.7**
	8/9/2007	~~<1.23~~	0.45	<0.60	4.62	372.2	**497.3**
	8/28/2007	~~<0.96~~	0.72	<0.47	6.38	615.9	**561.4**
	9/23/2007	~~<7.02~~	<0.60	<1.65	<12.11	541.0	298.7
	Mean	~~1.27~~	0.44	0.40	5.36	501.1	**460.8**
NB2	**7/23/2007**	~~<1.07~~	0.72	<0.52	26.78	1930.3	**579.9**
	8/9/2007	~~<1.02~~	0.98	<0.50	20.09	977.5	**856.5**
	8/28/2007	~~<0.95~~	1.98	<0.46	157.46	4695.6	**690.8**
	9/23/2007	~~<8.19~~	<0.70	<1.92	205.13	5887.4	170.2
	Mean	~~1.40~~	1.01	0.43	**102.37**	**3372.7**	**574.4**
NB3	**7/23/2007**	~~<1.19~~	0.52	<0.58	11.01	1106.1	**401.6**
	8/9/2007	~~<1.25~~	0.74	<0.61	27.31	1474.8	**468.7**
	8/28/2007	~~1.40~~	2.72	<0.52	32.59	2486.2	**1749.6**
	9/23/2007	~~<8.50~~	<0.72	<1.99	42.59	2854.5	52.6
	Mean	~~1.72~~	1.09	0.46	28.38	1980.4	**668.1**
KR4	**7/23/2007**	~~<1.15~~	0.53	<0.56	9.21	888.8	310.6
	8/9/2007	~~<1.27~~	1.77	<0.62	16.00	1215.6	216.6
	8/28/2007	~~<0.99~~	1.62	<0.48	16.47	1504.1	**678.1**
	9/23/2007	~~<9.77~~	<0.83	<2.29	22.85	1650.9	60.7
	Mean	~~1.65~~	1.08	0.49	16.13	1314.9	316.5
KR5	**7/23/2007**	~~<1.21~~	0.51	<0.59	9.26	811.9	265.7
	8/9/2007	~~226.75~~	283.66	<0.62	758.96	1307.6	191.1
	8/28/2007	~~113.90~~	217.77	<0.60	195.28	1627.4	**603.6**
	9/23/2007	~~<9.95~~	<0.85	<2.33	17.49	1757.1	<46.2
	Mean	~~**86.56**~~	**125.59**	0.52	**245.25**	1376.0	270.9
KR6	**7/23/2007**	~~<1.17~~	0.89	<0.57	10.79	1094.5	247.5
	8/9/2007	~~<0.98~~	2.01	<0.48	17.00	1558.3	181.6
	8/28/2007	~~1.29~~	2.55	<0.53	16.10	1937.2	**458.9**
	9/23/2007	~~<8.02~~	1.26	<1.88	15.69	2557.5	121.9
	Mean	~~1.59~~	1.68	0.43	14.90	1786.9	252.5
KR7	**7/23/2007**	~~<1.06~~	1.30	<0.51	10.71	1196.6	268.7
	8/9/2007	~~1.22~~	2.62	<0.58	14.88	2392.8	146.4
	8/28/2007	~~2.04~~	3.95	<0.44	15.99	1280.3	**440.1**
	9/23/2007	~~<9.23~~	1.64	<2.17	<15.92	2829.0	48.3
	Mean	~~2.10~~	2.38	0.46	12.39	1924.7	225.9
KR8	**7/23/2007**	~~<1.23~~	1.59	<0.60	10.99	1464.1	235.0
	8/9/2007	~~1.74~~	3.97	<0.51	13.54	2647.1	190.2
	8/28/2007	~~2.90~~	5.73	<0.44	40.21	10421.8	**420.1**
	9/23/2007	~~<7.42~~	2.01	<1.74	16.58	3557.4	46.4
	Mean	~~2.24~~	3.33	0.41	20.33	**4522.6**	222.9

2007 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result) (A strikethrough is for information not to be used):

Sample	Si (ppb)	P (ppb)	S (ppb)	Cl (ppb)	~~Ca 42 (ppb)~~	Ca 43 (ppb)	Ti (ppb)
NB1	1101	<1189	<49879	3863	~~<6663~~	621	2.39
	669	<1588	<66605	2982	~~<8898~~	552	<2.65
	751	<1234	<51767	5375	~~<6915~~	924	2.67
	<1343	<3035	<20152	<22145	~~<27584~~	814	<10.15
	798	881	23550	5823	~~6258~~	728	2.87
NB2	3112	<1373	<57587	39886	~~<7693~~	8234	5.90
	3021	<1319	<55319	21696	~~<7390~~	4873	9.57
	3252	<1223	<51284	34981	~~26846~~	28909	12.22
	2635	<3540	55069	40273	~~44199~~	44059	<11.84
	3005	932	27816	34209	~~19647~~	**18788**	8.40
NB3	1877	<1538	<64489	52670	~~<8615~~	5020	2.66
	1932	<1606	<67337	72142	~~<8995~~	7649	4.71
	3224	<1375	<57659	110553	~~<7703~~	11097	10.69
	<1624	<3670	<24375	178021	~~<33363~~	18177	<12.27
	1961	1024	26733	**103347**	~~7335~~	10486	6.05
KR4	1994	<1488	<62391	26555	~~<8335~~	3588	<2.49
	1907	<1634	<68539	40356	~~<9156~~	4835	<2.73
	2799	<1274	<53409	49280	~~<7135~~	5936	4.75
	<1868	<4221	<28033	77278	~~<38370~~	8932	<14.11
	1909	1077	26547	48367	~~7875~~	5823	3.06
KR5	1766	<1560	<65429	25045	~~<8741~~	3715	<2.61
	2232	<1641	<68803	34222	~~<9191~~	6318	<2.74
	2717	<1586	<66526	43111	~~<8887~~	7363	4.40
	<1902	<4299	<28550	71062	~~<39078~~	10807	<14.37
	1917	1136	28664	10840	~~8237~~	7050	3.57
KR6	1988	<1512	<63397	30396	~~<8469~~	4894	<2.53
	2433	<1258	<52768	33912	~~<7049~~	8128	<2.10
	3052	<1393	<58418	41099	~~<7804~~	9085	4.99
	2245	<3467	<23022	64033	~~<31511~~	13445	<11.59
	2430	954	24701	42360	~~6854~~	8888	3.18
KR7	1734	<1362	<57110	31271	~~<7629~~	5350	<2.28
	2502	<1535	<64355	35465	~~<8597~~	8973	<2.56
	1608	<1157	<48507	46573	~~9434~~	10805	4.62
	<1765	<3989	<26494	65880	~~<36263~~	13448	<13.34
	1682	1005	24558	22399	~~8920~~	9644	3.43
KR8	1883	<1592	<66772	38293	~~<8920~~	6282	<2.66
	2877	<1337	<56083	40573	~~<7492~~	9207	<2.23
	3447	<1176	<49300	141799	~~7353~~	12674	6.09
	1960	<3206	<21294	74983	~~<29146~~	13149	<10.72
	2542	914	24181	73912	~~7533~~	10328	3.47

2007 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result):

Sample	V (ppb)	Cr 52 (ppb)	Cr 53 (ppb)	Fe 54 (ppb)	Mn (ppb)	Fe 56 (ppb)	Fe 57 (ppb)
NB1	0.93	<0.30	<1.23	682	31.26	708	689
	0.78	<0.41	<1.64	432	20.34	541	439
	1.01	<0.32	<1.28	541	28.96	504	534
	<0.56	<3.37	<7.78	<1522	17.60	260	<221
	0.75	0.55	1.49	604	24.54	503	443
NB2	1.50	<0.35	<1.42	1713	326.24	1964	1690
	2.13	<0.34	<1.36	1576	237.27	1567	1566
	1.91	<0.31	<1.26	3391	817.56	3479	3447
	0.66	<3.93	<9.08	<1776	384.53	1418	1632
	1.55	0.62	1.64	**1892**	**441.40**	**2107**	**2084**
NB3	1.29	<0.39	<1.59	1033	132.58	1134	1048
	1.61	<0.41	<1.66	1181	219.98	1149	1176
	3.14	<0.35	1.44	2372	602.15	2377	2373
	<0.67	<4.07	<9.41	<1841	120.67	<277	<697
	1.59	0.65	1.94	**1377**	268.85	**1200**	**1236**
KR4	1.08	<0.38	<1.54	755	88.47	794	756
	1.27	<0.42	<1.69	675	27.44	691	671
	1.31	<0.33	<1.32	1104	54.23	1077	1119
	<0.77	<4.69	<10.82	<2117	16.15	<273	<505
	1.01	0.73	1.92	898	46.57	675	700
KR5	0.93	<0.40	<1.61	663	70.74	694	673
	1.08	<0.42	<1.70	592	38.93	469	576
	1.12	<0.41	<1.64	892	55.05	682	877
	<0.79	<4.77	<11.02	<2156	22.11	<285	<564
	0.88	0.75	2.00	806	46.71	497	602
KR6	0.89	<0.39	<1.56	741	91.30	935	723
	0.88	<0.32	<1.30	661	209.28	573	670
	0.91	<0.36	<1.44	832	138.31	778	834
	<0.64	<3.85	<8.89	<1739	103.45	399	<611
	0.75	0.62	1.65	776	135.59	671	633
KR7	0.98	<0.35	<1.41	830	167.57	872	839
	0.66	<0.39	<1.59	603	223.28	639	610
	0.78	<0.30	<1.20	967	290.60	970	976
	<0.73	<4.43	<10.23	<2001	241.47	<279	<614
	0.70	0.68	1.80	850	230.73	655	683
KR8	0.81	<0.41	<1.65	794	167.41	756	800
	0.67	<0.34	<1.38	554	287.01	478	568
	0.87	<0.30	<1.22	841	339.38	948	880
	<0.59	<3.56	<8.22	<1608	263.99	<230	<529
	0.66	0.58	1.56	748	264.45	574	628

2007 results for Metals (“<” indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result):

Sample	Co (ppb)	Ni (ppb)	Cu (ppb)	Zn (ppb)	As (ppb)	Br (ppb)	Se (ppb)
NB1	0.16	0.71	1.29	22.16	<0.82	<44.26	<8.11
	<0.15	<0.86	<1.02	16.90	<1.09	<59.11	<10.84
	0.17	<0.67	<0.79	21.61	<0.85	<45.94	<8.41
	<0.56	9.78	<7.63	48.41	<4.42	<264.52	<78.82
	0.17	2.81	1.50	27.27	0.90	51.73	13.27
NB2	0.20	2.34	4.04	26.47	<0.95	62.98	<9.35
	0.26	1.31	6.32	39.97	<0.91	<49.09	<8.99
	0.59	1.15	**7.79**	37.34	<0.84	80.14	<8.31
	<0.65	<2.58	<7.60	19.08	<5.16	<308.57	<87.99
	0.34	1.52	**5.49**	**30.72**	0.98	80.49	14.33
NB3	<0.14	1.05	2.13	21.80	<1.06	<57.23	<10.48
	0.19	<0.87	1.29	26.11	<1.11	70.34	<10.93
	0.73	1.31	**7.99**	24.10	<0.95	87.00	<9.34
	<0.67	<2.67	<7.57	17.86	<5.35	<319.94	<91.59
	0.33	1.03	**3.80**	22.47	1.06	86.48	15.29
KR4	<0.14	0.85	1.39	27.99	<1.03	<55.37	<10.14
	<0.15	<0.88	1.06	22.16	<1.13	<60.82	<11.14
	0.29	0.80	**4.32**	34.14	<0.88	61.64	<8.67
	<0.78	<3.07	<7.80	14.48	<6.15	<367.96	<108.57
	0.21	0.91	**2.67**	24.69	1.15	77.43	17.32
KR5	<0.15	<0.84	<1.00	14.24	<1.08	<58.06	<10.64
	<0.15	<0.89	<1.05	15.19	<1.13	<61.06	<11.18
	0.23	<0.86	**3.10**	21.84	<1.10	<59	<10.81
	<0.79	<3.13	<7.56	15.87	<6.26	<374.74	<110.40
	0.19	0.72	1.98	16.79	1.20	69.11	17.88
KR6	<0.14	1.30	<0.97	18.83	<1.04	<56.26	<10.30
	<0.12	<0.68	<0.81	20.20	<0.87	51.35	<8.57
	0.24	1.22	**5.47**	28.04	<0.96	<51.84	<9.49
	<0.64	<2.53	<7.63	23.63	<5.05	<302.18	<88.28
	0.69	1.03	**2.54**	22.68	0.99	64.12	14.58
KR7	0.19	2.33	2.25	31.33	<0.94	<50.68	<9.28
	<0.14	1.27	<0.98	16.66	<1.06	<57.11	<10.45
	0.30	2.07	**2.42**	21.25	<0.80	58.74	<7.87
	<0.73	<2.91	<7.53	13.51	<5.81	<347.75	<100.92
	0.23	1.78	**2.23**	20.69	1.08	71.63	16.07
KR8	0.21	1.15	1.40	37.34	<1.10	<59.25	<10.85
	0.42	3.48	3.02	33.31	<0.92	<49.77	<9.11
	0.42	2.46	**3.84**	23.47	<0.82	315.83	<7.85
	<0.59	<2.34	<7.55	18.21	<4.67	<279.50	<79.79
	0.34	2.07	**3.01**	28.08	0.94	127.52	13.45

2007 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result):

Sample	Rb (ppb)	Sr (ppb)	Mo (ppb)	Ag (ppb)	Cd (ppb)	Sn (ppb)	Sb (ppb)	I (ppb)
NB1	0.17	5	<0.46	<0.17	<1.23	<0.35	<0.38	<7.07
	<0.16	4	<0.61	<0.22	<1.65	<0.47	<0.51	<9.43
	0.29	7	<0.48	<0.17	<1.28	<0.37	<0.39	<7.33
	<0.64	6	<1.98	<0.96	<5.19	<2.18	<1.79	<13.68
	0.22	6	0.44	0.19	1.17	0.42	0.38	4.69
NB2	1.70	35	<0.53	<0.19	<1.42	<0.41	<0.44	<8.16
	1.31	22	<0.51	<0.18	<1.37	<0.39	<0.42	<7.84
	4.83	**119**	<0.47	<0.17	<1.27	<0.36	<0.39	<7.26
	5.49	**160**	<2.31	<1.12	<6.05	<2.55	<2.09	<15.96
	3.33	**84**	0.48	0.21	1.26	0.46	0.42	4.90
NB3	0.88	21	<0.59	<0.21	<1.60	<0.46	<0.49	<9.13
	1.66	29	<0.62	<0.22	<1.67	<0.48	<0.51	<9.54
	3.41	43	<0.53	<0.19	<1.43	<0.41	<0.44	<8.17
	2.74	57	<2.39	<1.16	<6.28	<2.64	<2.17	<16.55
	2.17	38	0.52	0.22	1.37	0.50	0.45	5.42
KR4	0.66	16	<0.57	<0.21	<1.54	<0.44	<0.48	<8.84
	1.02	20	<0.63	<0.23	<1.70	<0.49	<0.52	<9.71
	1.70	25	<0.49	<0.18	<1.32	<0.38	<0.41	<7.57
	1.36	29	<2.75	<1.33	<7.22	<3.04	<2.49	<19.03
	1.19	23	0.56	0.24	1.47	0.54	0.49	5.64
KR5	0.58	15	<0.60	<0.22	<1.62	<0.46	<0.50	<9.27
	0.89	24	<0.63	<0.23	<1.70	<0.49	<0.52	<9.75
	1.43	27	<0.61	<0.22	<1.65	<0.47	<0.51	<9.42
	1.28	33	<2.80	<1.36	<7.35	<3.09	<2.54	<19.39
	1.05	25	0.58	0.25	1.54	0.56	0.51	5.98
KR6	0.65	22	<0.58	<0.21	<1.57	<0.45	<0.48	<8.98
	0.96	35	<0.49	<0.18	<1.31	<0.37	<0.40	<7.47
	1.45	38	<0.54	<0.19	<1.45	<0.41	<0.45	<8.27
	1.21	54	<2.26	<1.09	<5.93	<2.49	<2.05	<15.63
	1.07	37	0.48	0.21	1.28	0.47	0.42	5.08
KR7	0.78	23	<0.53	<0.19	<1.41	<0.40	<0.44	<8.09
	1.00	39	<0.59	<0.21	<1.59	<0.46	<0.49	<9.12
	1.44	48	<0.45	<0.16	<1.20	<0.34	<0.37	<6.87
	1.25	54	<2.60	<1.26	<6.82	<2.87	<2.35	<17.99
	1.12	41	0.52	0.23	1.38	0.51	0.46	5.26
KR8	0.86	27	<0.62	<0.22	<1.65	<0.47	<0.51	<9.46
	1.21	46	<0.52	<0.19	<1.39	<0.40	<0.43	<7.94
	2.12	91	<0.45	<0.16	<1.22	<0.35	<0.38	<6.98
	1.34	61	<2.09	<1.01	<5.48	<2.31	<1.89	<14.46
	1.38	56	0.46	0.20	1.22	0.44	0.40	4.86

2007 results for Metals ("<" indicates below detection limits, these values were divided in half to determine the statistical means) (raw data in **bold** indicates an unusual result):

Sample	Cs (ppb)	Ba (ppb)	La (ppb)	Ce (ppb)	Hg (ppb)	Tl (ppb)	Pb (ppb)	Bi (ppb)	U (ppb)
NB1	<0.08	10.55	0.93	1.73	<1.26	<0.19	0.45	<0.21	<0.33
	<0.11	5.82	0.56	1.03	<1.69	<0.26	0.42	<0.28	<0.44
	<0.08	15.05	0.79	1.51	<1.31	<0.20	0.60	<0.22	<0.34
	<0.34	10.70	0.43	0.81	<1.94	<0.26	<2.67	<0.24	<0.17
	0.08	10.53	0.68	1.27	0.78	0.11	0.70	0.12	0.16
NB2	<0.09	32.93	1.76	3.01	<1.46	<0.22	1.90	<0.24	2.27
	<0.09	29.20	1.83	3.88	<1.40	<0.21	2.55	<0.23	1.29
	0.35	73.62	2.14	4.61	<1.30	<0.20	3.55	<0.21	2.52
	<0.39	41.72	0.51	1.13	<2.27	<0.30	<3.12	<0.28	4.11
	0.16	44.38	1.56	3.16	0.80	0.12	**2.39**	0.12	**2.55**
NB3	<0.10	22.49	1.45	1.69	<1.63	<0.25	0.62	<0.27	2.19
	<0.11	27.65	2.50	3.57	<1.70	<0.26	1.04	<0.28	2.51
	0.38	90.20	4.86	8.43	<1.46	<0.22	3.91	<0.24	3.05
	<0.41	26.94	<0.35	<0.37	<2.35	<0.32	<3.23	<0.29	0.81
	0.17	41.82	2.25	3.47	0.89	0.13	**1.80**	0.14	**2.14**
KR4	<0.10	20.61	0.91	1.15	<1.58	<0.24	0.36	<0.26	1.31
	<0.11	20.89	0.79	0.88	<1.74	<0.26	0.37	<0.29	1.16
	0.13	54.36	1.32	2.21	<1.35	<0.21	1.35	<0.22	0.77
	<0.47	23.24	<0.41	<0.43	<2.71	<0.36	<3.72	<0.34	<0.24
	0.12	29.78	0.69	1.11	0.92	0.13	0.99	0.14	0.84
KR5	<0.10	18.83	0.82	1.05	<1.66	<0.25	0.35	<0.27	1.14
	<0.11	28.29	0.66	0.68	<1.74	<0.26	<0.35	<0.29	1.09
	0.11	56.53	1.07	1.73	<1.68	<0.26	1.06	<0.28	0.65
	<0.48	31.15	<0.41	<0.44	<2.76	<0.37	<3.79	<0.34	0.25
	0.11	33.70	0.64	0.92	0.98	0.14	0.87	0.15	0.78
KR6	<0.10	23.03	0.77	0.90	<1.60	<0.24	0.50	<0.26	1.30
	<0.08	36.60	0.66	0.75	<1.34	<0.20	0.41	<0.22	0.91
	0.11	59.97	0.92	1.46	<1.48	<0.22	0.97	<0.24	0.56
	<0.39	44.92	<0.33	0.46	<2.22	<0.30	<3.05	<0.28	0.20
	0.10	41.13	0.63	0.89	0.83	0.12	0.85	0.13	0.74
KR7	<0.09	25.15	0.84	1.00	<1.45	<0.22	0.47	<0.24	1.43
	<0.10	37.27	0.52	0.54	<1.63	<0.25	<0.33	<0.27	0.85
	0.10	58.83	0.82	1.31	<1.23	<0.19	1.86	<0.20	0.43
	<0.44	41.46	<0.38	<0.40	<2.56	<0.34	<3.52	<0.32	<0.23
	0.10	40.68	0.59	0.76	0.86	0.13	**1.06**	0.13	0.71
KR8	<0.11	28.39	0.76	0.86	<1.69	<0.26	<0.34	<0.28	1.24
	<0.09	40.64	0.53	0.63	<1.42	<0.22	0.52	<0.23	0.63
	0.15	61.18	0.75	1.21	<1.25	<0.19	0.95	<0.21	0.40
	<0.36	43.94	<0.31	<0.33	<2.06	<0.28	<2.83	<0.25	<0.18
	0.11	43.54	0.55	0.72	0.80	0.12	0.76	0.12	0.59

2006 results for Metals in Sediment ("-" indicates below detection limits) (raw data in **bold** indicates an unusual result) (A strikethrough is for information not to be used):

Name	Ca	Ti	V	Cr 52	Cr 53
chondrite	13500	660	85	3975	3975
Limit of Detection	61	0.826	1.486	1.439	0.603
BLANK-17	2662	1.386	-0.493	0.701	0.597
Sweep 4 Metals 1 sed	5799	1295.468	32.968	16.829	~~23.819~~
Sweep 4 Metals 2 sed	12017	862.920	14.415	8.117	~~23.254~~
Sweep 4 Metals 3 sed	16038	1367.831	108.877	18.551	~~100.526~~
Sweep 4 Metals 4 sed	17412	1013.727	86.807	28.126	~~90.777~~
Sweep 4 Metals 5 sed	17407	2559.890	76.200	**44.882**	~~96.591~~
Sweep 4 Metals 6 sed	15682	1910.580	81.598	**40.105**	~~101.017~~
Sweep 4 Metals 7 sed	12920	1649.936	69.159	**37.297**	~~254.849~~
Sweep 4 Metals 7sed dup	29811	1565.132	70.166	36.060	~~226.005~~
Sweep 4 Metals 8	13453	3642.485	93.391	**77.866**	~~133.047~~
Sweep 4 Metals 8*	13254	3839.967	98.489	**82.441**	~~139.813~~

Name	Fe 54	Mn	Fe 57	Co	Ni
chondrite	0	2940	0	764	0.0165
Limit of Detection	124	0.195	91	0.03	0.83
BLANK-17	81	0.723	-59	0.03	3.35
Sweep 4 Metals 1 sed	5098	63.383	4991	0.86	29.37
Sweep 4 Metals 2 sed	11157	755.983	11158	2.00	9.34
Sweep 4 Metals 3 sed	61643	5477.944	61325	10.19	14.80
Sweep 4 Metals 4 sed	41311	**13683.076**	46495	26.10	21.21
Sweep 4 Metals 5 sed	38735	5523.643	38774	13.38	29.03
Sweep 4 Metals 6 sed	45976	654.633	45998	10.33	22.72
Sweep 4 Metals 7 sed	**144524**	**18793.141**	**149020**	49.24	53.44
Sweep 4 Metals 7sed dup	**128418**	**35691.292**	**131043**	87.10	92.99
Sweep 4 Metals 8	40942	1674.470	40526	21.37	54.68
Sweep 4 Metals 8*	43050	1681.376	42688	22.32	58.40

2006 results for Metals in Sediment ("-" indicates below detection limits) (raw data in **bold** indicates an unusual result) (A strikethrough is for information not to be used):

Name	Cu	Zn	As	Se 77	Se 82
chondrite	168	462	2.87	27.3	0
Limit of Detection	0.269	4.504	0.587	5.005	3.149
BLANK-17	0.592	10.910	-0.166	-0.432	2850.127
Sweep 4 Metals 1 sed	12.323	59.050	1.196	2.299	~~4669.159~~
Sweep 4 Metals 2 sed	6.545	78.653	1.094	1.659	~~2707.854~~
Sweep 4 Metals 3 sed	15.344	**143.669**	4.917	4.263	~~5389.007~~
Sweep 4 Metals 4 sed	14.473	**158.025**	**6.150**	0.615	~~1900.738~~
Sweep 4 Metals 5 sed	28.452	**127.618**	**6.068**	2.064	~~3114.312~~
Sweep 4 Metals 6 sed	18.827	107.271	**7.165**	6.076	~~4127.523~~
Sweep 4 Metals 7 sed	28.651	***335.370***	**23.441**	3.374	~~3367.803~~
Sweep 4 Metals 7sed dup	33.627	***514.184***	**32.976**	2.728	~~560.553~~
Sweep 4 Metals 8	**55.024**	**191.474**	**11.368**	3.731	~~1919.017~~
Sweep 4 Metals 8*	**59.058**	**246.238**	**12.196**	4.744	~~1942.021~~

Name	Br 79	Mo	Ag 107	Ag 109	Cd
chondrite	27.3	1.38	0.33	0.33	1.01
Limit of Detection	15.466	0.300	0.040	0.012	0.113
BLANK-17	-34.311	-0.119	-0.005	0.016	-0.021
Sweep 4 Metals 1 sed	138.234	2.259	0.228	0.224	0.006
Sweep 4 Metals 2 sed	-37.097	0.379	0.240	0.092	0.045
Sweep 4 Metals 3 sed	185.868	**39.393**	0.272	0.193	**0.932**
Sweep 4 Metals 4 sed	-10.189	8.703	0.151	0.116	**0.931**
Sweep 4 Metals 5 sed	54.546	4.334	0.317	0.110	0.518
Sweep 4 Metals 6 sed	116.107	12.961	0.264	0.154	0.523
Sweep 4 Metals 7 sed	62.698	14.708	0.193	0.151	**0.874**
Sweep 4 Metals 7sed dup	0.738	23.759	0.169	0.097	**1.297**
Sweep 4 Metals 8	59.404	9.346	0.317	0.183	0.473
Sweep 4 Metals 8*	84.493	9.980	0.383	0.219	0.512

2006 results for Metals in Sediment ("-" indicates below detection limits) (raw data in **bold** indicates an unusual result):

Name	Sn	Sb	Te	I	La
chondrite	2.52	0.233	3.42	0	0.367
Limit of Detection	0.020	0.101	0.60	5.406	0.029
BLANK-17	0.091	-0.048	-0.73	6.106	-0.001
Sweep 4 Metals 1 sed	1.888	0.230	-0.09	4.025	21.842
Sweep 4 Metals 2 sed	1.599	0.281	-0.90	5.331	22.167
Sweep 4 Metals 3 sed	2.759	0.438	-0.25	2.187	66.120
Sweep 4 Metals 4 sed	2.500	**1.434**	-0.43	9.378	35.633
Sweep 4 Metals 5 sed	2.857	0.564	-0.34	0.852	40.716
Sweep 4 Metals 6 sed	3.318	0.533	-0.82	2.124	54.014
Sweep 4 Metals 7 sed	1.853	0.515	0.11	0.673	42.048
Sweep 4 Metals 7sed dup	1.665	0.653	-0.25	12.365	46.616
Sweep 4 Metals 8	**22.181**	0.887	-0.44	0.793	40.918
Sweep 4 Metals 8*	**24.620**	1.005	0.42	-0.030	42.196

Name	Ce	Pr	Nd	Er	Tm
chondrite	0.957	0.137	0.711	0.249	0.036
Limit of Detection	0.039	0.008	0.141	0.076	0.001
BLANK-17	0.019	-0.006	-0.026	-0.026	0.003
Sweep 4 Metals 1 sed	42.771	4.544	17.471	0.916	0.144
Sweep 4 Metals 2 sed	43.091	4.363	15.311	1.416	0.223
Sweep 4 Metals 3 sed	129.689	13.124	48.351	3.453	0.506
Sweep 4 Metals 4 sed	108.542	6.922	25.581	1.979	0.270
Sweep 4 Metals 5 sed	100.374	8.940	33.610	2.759	0.408
Sweep 4 Metals 6 sed	159.511	12.662	48.140	3.491	0.505
Sweep 4 Metals 7 sed	92.194	8.288	30.673	2.399	0.356
Sweep 4 Metals 7sed dup	124.896	9.044	32.741	2.700	0.382
Sweep 4 Metals 8	85.401	8.977	32.379	2.344	0.359
Sweep 4 Metals 8*	88.184	9.117	33.943	2.426	0.363

2006 results for Metals in Sediment ("-" indicates below detection limits) (raw data in **bold** indicates an unusual result):

Name	Lu	W	Hg	Pb	Bi	Th
chondrite	0.038	0.089	0.585	3.65	0.167	0.0425
Limit of Detection	0.011	0.002	0.008	0.123	0.019	0.121
BLANK-17	-0.006	0.261	-0.105	0.888	0.052	0.482
Sweep 4 Metals 1 sed	0.134	1.235	-0.176	29.391	0.187	4.992
Sweep 4 Metals 2 sed	0.253	1.081	-0.236	15.815	0.695	9.886
Sweep 4 Metals 3 sed	0.495	2.144	-0.183	**46.821**	0.302	**20.289**
Sweep 4 Metals 4 sed	0.269	2.792	-0.176	***132.174***	0.184	12.504
Sweep 4 Metals 5 sed	0.430	2.907	-0.204	**46.074**	0.293	14.596
Sweep 4 Metals 6 sed	0.509	2.938	-0.186	**49.783**	0.280	**27.574**
Sweep 4 Metals 7 sed	0.341	3.638	-0.089	21.235	0.187	10.721
Sweep 4 Metals 7sed dup	0.364	3.484	-0.097	23.350	0.168	10.422
Sweep 4 Metals 8	0.371	5.346	-0.211	***99.050***	0.341	13.850
Sweep 4 Metals 8*	0.396	5.557	-0.157	***104.753***	0.343	13.953

2007 results for Metals in Sediment ("-" indicates below detection limits) (raw data in **bold** indicates an unusual result) (A strikethrough is for information not to be used):

Name	Ca	Ti	V	Cr 52	Cr 53	Fe 54
chondrite	13500	660	85	3975	3975	0
Limit of Detection	19	0.578	0.042	0.513	0.711	181
BLANK-31	5194	1.891	0.542	0.925	0.816	158
sediment 1 sept 11/07	8661	787.14	30.562	5.636	~~13.965~~	8282
sediment 2 sept 11/07	10327	920.987	14.5	2.695	~~14.785~~	11449
sediment 3 sept 11/07	8440	656.587	41.698	5.667	~~18.601~~	11829
sediment 4 sept 11/07	10544	1516.105	70.117	10.183	~~52.283~~	43568
sediment 5 sept 11/07	9635	1914.686	42.584	15.51	~~36.864~~	23848
sediment 6 sept 11/07	9958	1657.001	58.323	23.9	~~59.793~~	38944
sediment 6 sept 11/07	9396	1566.072	49.4	22.031	~~55.584~~	36591
sediment 7 sept 11/07	7833	1757.584	50.527	28.966	~~114.345~~	97022
sediment 8 sept 11/07	8463	2382.074	55.798	34.856	~~70.348~~	31598
sediment 8 sept 11/07	7640	2366.96	58.052	35.788	~~62.519~~	31671

2007 results for Metals in Sediment ("-" indicates below detection limits) (raw data in **bold** indicates an unusual result) (A strikethrough is for information not to be used):

Name	Mn	Fe 57	Co	Ni	Cu	Zn
chondrite	2940	0	764	0.0165	168	462
Limit of Detection	1.225	88	0.08	0.08	0.054	0.308
BLANK-31	1.68	568	0.048	170.441	2.091	30.291
sediment 1 sept 11/07	92.389	8640	1.03	40.324	9.225	73.836
sediment 2 sept 11/07	838.204	11568	1.988	51.211	16.196	116.847
sediment 3 sept 11/07	360.359	12110	3.757	56.000	13.858	115.249
sediment 4 sept 11/07	6335.924	44228	17.427	56.009	21.388	**170.769**
sediment 5 sept 11/07	1011.667	23982	5.231	56.325	2.955	109.389
sediment 6 sept 11/07	795.222	39522	10.006	64.449	5.764	109.498
sediment 6 sept 11/07	945.542	36636	8.506	64.034	6.04	**125.54**
sediment 7 sept 11/07	3363.224	96839	12.797	72.792	7.002	**127.52**
sediment 8 sept 11/07	481.428	32126	9.364	71.283	12.414	97.073
sediment 8 sept 11/07	469.888	32093	9.439	75.222	15.137	120.299

Name	As	Se 77	Se 82	Br 79	Mo	Ag 107
chondrite	2.87	27.3	0	27.3	1.38	0.33
Limit of Detection	0.082	3.239	3.06	116.5	0.199	0.043
BLANK-31	0.05	-2.734	1084.987	596.1	0.666	0.043
sediment 1 sept 11/07	0.394	3.617	~~1249.452~~	624.3	1.96	0.063
sediment 2 sept 11/07	1.255	5.24	~~1152.654~~	583	1.245	0.04
sediment 3 sept 11/07	2.592	2.885	~~1214.487~~	594	8.904	0.228
sediment 4 sept 11/07	3.094	2.642	~~1251.842~~	619.8	5.267	0.078
sediment 5 sept 11/07	2.302	0.046	~~1173.738~~	593.9	1.965	0.123
sediment 6 sept 11/07	3.407	4.678	~~1341.867~~	656.6	4.831	0.197
sediment 6 sept 11/07	2.624	3.117	~~1291.58~~	607.1	3.937	0.204
sediment 7 sept 11/07	***53.321***	5.702	~~1350.906~~	611	8.696	0.078
sediment 8 sept 11/07	5.465	-5.767	~~1340.496~~	564.4	4.395	-0.084
sediment 8 sept 11/07	**5.809**	-3.438	~~1330.252~~	586.1	5.001	0.119

2007 results for Metals in Sediment ("-" indicates below detection limits) (raw data in **bold** indicates an unusual result):

Name	Ag 109	Cd	Sn	Sb	Te	I
chondrite	0.33	1.01	2.52	0.233	3.42	0
Limit of Detection	0.018	0.285	0.021	0.085	1.4	0.699
BLANK-31	0.058	0.166	0.325	0.261	-3.21	-5.451
sediment 1 sept 11/07	0.15	0.095	1.434	0.474	-0.7	-5.156
sediment 2 sept 11/07	0.185	0.259	2.054	0.453	-1.08	-4.872
sediment 3 sept 11/07	0.363	**0.874**	1.123	0.376	0.48	-3.971
sediment 4 sept 11/07	-0.002	0.146	2.306	-0.083	-5.16	-3.225
sediment 5 sept 11/07	0.019	-0.386	1.449	0.349	-0.96	-3.813
sediment 6 sept 11/07	0.268	**0.78**	1.899	0.288	1.45	-2.624
sediment 6 sept 11/07	0.122	**0.699**	1.657	0.665	-0.51	-2.191
sediment 7 sept 11/07	0.127	0.324	1.794	0.745	-2.27	-4.434
sediment 8 sept 11/07	-0.043	-0.287	3.199	0.453	-4.03	-5.922
sediment 8 sept 11/07	0.144	**0.594**	2.217	0.83	0.78	-1.888

Name	La	Ce	Pr	Nd	Er	Tm
chondrite	0.367	0.957	0.137	0.711	0.249	0.036
Limit of Detection	0.013	0.023	0.017	0.156	0.045	0.014
BLANK-31	0.002	0.056	0.007	0.39	0.096	0.018
sediment 1 sept 11/07	22.395	39.799	4	14.196	1.028	0.174
sediment 2 sept 11/07	18.58	36.148	3.711	12.937	1.05	0.218
sediment 3 sept 11/07	108.298	134.957	22.854	83.171	4.382	0.614
sediment 4 sept 11/07	24.261	71.231	4.788	17.312	1.595	0.262
sediment 5 sept 11/07	18.329	39.292	4.101	14.985	1.25	0.181
sediment 6 sept 11/07	36.437	78.252	7.732	27.537	2.144	0.359
sediment 6 sept 11/07	26.626	55.812	5.462	20.005	1.817	0.269
sediment 7 sept 11/07	26.516	51.961	5.43	19.464	1.348	0.248
sediment 8 sept 11/07	28.96	55.494	5.963	21.493	1.194	0.222
sediment 8 sept 11/07	26.529	50.592	5.57	19.598	1.423	0.202

2007 results for Metals in Sediment ("-" indicates below detection limits) (raw data in **bold** indicates an unusual result):

Name	Lu	W	Hg	Pb	Bi	Th
chondrite	0.038	0.089	0.585	3.65	0.167	0.0425
Limit of Detection	0.012	0.002	0.007	0.07	0.018	0.016
BLANK-31	-0.001	0.545	-0.167	0.668	-0.043	0.021
sediment 1 sept 11/07	0.108	1.633	-0.209	**58.019**	0.064	2.736
sediment 2 sept 11/07	0.219	1.604	-0.28	16.7	0.179	6.299
sediment 3 sept 11/07	0.567	1.126	-0.106	**35.609**	0.178	14.015
sediment 4 sept 11/07	0.281	1.81	-0.134	**34.557**	0.111	6.833
sediment 5 sept 11/07	0.236	1.533	-0.198	15.222	0.133	5.989
sediment 6 sept 11/07	0.365	3.716	-0.017	25.666	0.249	11.498
sediment 6 sept 11/07	0.273	2.557	-0.06	20.675	0.119	7.842
sediment 7 sept 11/07	0.214	4.096	-0.037	15.498	0.183	7.314
sediment 8 sept 11/07	0.203	2.412	-0.397	20.866	0.184	7.821
sediment 8 sept 11/07	0.246	3.464	-0.049	20.759	0.231	7.816

2006 results for E. coli (raw values in **bold** indicates an unusual result):

CFU/100ml		CFU/100ml		CFU/100ml	
Sample ID	Sweep 1	Sample ID	Sweep 2	Sample ID	Sweep 3
Site 1	<1	Site 1	3	Site 1	30
Site 2	160	Site 2a	77	Site 2	**1300**
Site 3	12	Site 2b	54	Site 3	69
Site 4	<1	Site 2c	48	Site 4	7
Site 5a	20	Site 3	22	Site 5	27
Site 5b	54	Site 4	24	Site 6	11
Site 5c	49	Site 5	20	Site 7	14
Site 6	23	Site 6	23	Site 8	**1400**
Site 7	70	Site 7	78	Site Xa	**220**
Site 8	**5600**	Site 8	**900**	Site Xb	**300**
Site 5 mean	**41**	**Site 2 mean**	**60**	**Site X mean**	**260**

2006 results for E. coli (raw values in **bold** indicates an unusual result):

CFU/100ml	
Sample ID	Sweep 4
Site 1	8
Site 2	**260**
Site 3	87
Site 4	12
Site 5	8
Site 6a	16
Site 6b	25
Site 6c	45
Site 7	26
Site 8	**1000**
Site 6 mean	**30**

CFU/100ml	
Sample ID	Mean
Site 1	10
Site 2	**445**
Site 3	47
Site 4	11
Site 5	24
Site 6	22
Site 7	47
Site 8	**2225**
Site X	**260**

2007 results for E. coli (raw values in **bold** indicates an unusual result):

Sweep/Date	**ID**	**Location**	*E. coli* count (CFU/100ml)
Sweep 1/July 24st, 2007	1	NB	22
	2	NB	**2200**
	3	NB	**360**
	4	KR	180
	5	KR	170
	6	KR	100
	6	KR	**210**
	6	KR	**200**
	7	KR	**280**
	8	KR	140

Sweep/Date	**ID**	**Location**	*E. coli* count (CFU/100ml)
Sweep 2/Aug 8th, 2007	1	NB	**2900**
	2	NB	**1050**
	3	NB	80
	4	KR	10
	5	KR	**400**
	6	KR	30
	7	KR	60
	8	KR	80
	8	KR	**220**
	8	KR	80

2007 results for E. coli (raw values in **bold** indicates an unusual result):

Sweep/Date	ID	Location	*E. coli* count (CFU/100ml)
Sweep 3 Aug 28th, 2007	1	NB	3
	2	NB	110
	3	NB	**210**
	4	KR	37
	4	KR	59
	4	KR	47
	5	KR	45
	6	KR	25
	7	KR	26
	8	KR	59

Sweep/Date	ID	Location	*E. coli* count (CFU/100ml)
Sweep 4 Sept 20th, 2007	1	NB	**430**
	2	NB	27
	3	NB	47
	4	KR	6
	5	KR	1
	6	KR	5
	7	KR	13
	8	KR	74
	8	KR	190
	8	KR	77

2006 and 2007 Results for Hardness:

ID	Hardness MEAN (PPM) 2006	Hardness MEAN (PPM) 2007
1	6.27	6.55
2	92.68	74.46
3	44.64	39.53
4	25.40	22.47
5	28.49	25.30
6	34.59	32.01
7	38.62	34.52
8	52.58	46.85

2006 results for PAH's ("<" means below detection limits):

Date	Sample ID	NAPHTALENE	ACENAPHTHYLENE	ACENAPHTHENE
	1	13	5	<5
	2	<5	<5	<5
	2	<5	<5	<5
	3	<5	<5	<5
August 20th, 2006	4	<5	<5	<5
Sweep 3	5	<5	<5	<5
	6	<5	<5	<5
	7	<5	<5	<5
	8	<5	<5	<5
	Guideline	34.6	5.87	6.71

Date	Sample ID	FLUORENE	PHENANTHRENE	ANTHRACENE	FLUORANTHENE
	1	<5	18	10	21
	2	<5	14	<5	19
	2	<5	12	<5	15
	3	<5	<5	<5	<5
August 20th, 2006	4	<5	<5	<5	<5
Sweep 3	5	<5	<5	<5	5
	6	<5	<5	<5	<5
	7	<5	<5	<5	<5
	8	5	<5	<5	16
	Guideline	21.2	41.9	N/A	21.2

Date	Sample ID	PYRENE	BENZ(A)ANTHRACENE	CHRYSENE	BENZO(A)PYRENE
	1	14	12	16	10
	2	39	13	20	15
	2	35	11	19	14
	3	<5	<5	<5	<5
August 20th, 2006	4	<5	<5	<5	<5
Sweep 3	5	<5	<5	<5	<5
	6	<5	<5	<5	<5
	7	<5	<5	<5	<5
	8	10	<5	<5	<5
	Guideline	53	31.7	57.1	31.9

2006 results for PAH's ("<" means below detection limits):

Date	Sample ID	BENZO(B)FLUORANTHENE	BENZO(K)FLUORANTHENE
August 20th, 2006 Sweep 3	1	18	11
	2	22	16
	2	20	15
	3	<5	<5
	4	<5	<5
	5	<5	<5
	6	<5	<5
	7	<5	<5
	8	<5	<5
	Guideline	N/A	N/A

Date	Sample ID	INDE0(1,2,3-C,D)PYRENE	DIBENZ(A,H)ANTHRACENE
August 20th, 2006 Sweep 3	1	17	<5
	2	43	<5
	2	42	<5
	3	<5	<5
	4	<5	<5
	5	<5	<5
	6	<5	<5
	7	<5	<5
	8	<5	<5
	Guideline	N/A	6.22

Date	Sample ID	BENZO(G,H,I)PERYLENE
August 20th, 2006 Sweep 3	1	<5
	2	14
	2	5
	3	<5
	4	<5
	5	<5
	6	<5
	7	<5
	8	<5
	Guideline	N/A

2007 results for PAH's ("<" means below detection limits):

Date	Sample ID	NAPHTALENE	ACENAPHTHYLENE	ACENAPHTHENE
August 28th, 2007 Sweep 3	1	6	<5	<5
	2	6	<5	<5
	3	<5	<5	<5
	4	8	<5	<5
	5	<5	<5	<5
	6	<5	<5	<5
	6	<5	<5	<5
	7	<5	<5	<5
	8	<5	<5	<5
	Guideline	34.6	5.87	6.71

Date	Sample ID	FLUORENE	PHENANTHRENE	ANTHRACENE
August 28th, 2007 Sweep 3	1	<5	6	<5
	2	<5	6	<5
	3	<5	20	6
	4	<5	<5	<5
	5	<5	<5	<5
	6	<5	<5	<5
	6	<5	<5	<5
	7	<5	<5	<5
	8	<5	<5	<5
	Guideline	21.2	41.9	N/A

Date	Sample ID	FLUORANTHENE	PYRENE	BENZ(A)ANTHRACENE
August 28th, 2007 Sweep 3	1	9	7	<5
	2	9	8	<5
	3	**30**	**51**	16
	4	8	15	<5
	5	<5	<5	<5
	6	<5	<5	<5
	6	<5	<5	<5
	7	<5	<5	<5
	8	<5	<5	<5
	Guideline	21.2	53	31.7

Date	Sample ID	CHRYSENE	BENZO(B)FLUORANTHENE	BENZO(K)FLUORANTHENE
August 28th, 2007 Sweep 3	1	8	16	11
	2	8	17	11
	3	24	24	22
	4	6	6	<5
	5	<5	<5	<5
	6	<5	<5	<5
	6	<5	<5	<5
	7	<5	<5	<5
	8	<5	<5	<5
	Guideline	57.1	N/A	N/A

Date	Sample ID	BENZO(A)PYRENE	INDE0(1,2,3-C,D)PYRENE
August 28th, 2007 Sweep 3	1	5	16
	2	6	17
	3	21	<5
	4	<5	<5
	5	<5	<5
	6	<5	<5
	6	<5	<5
	7	<5	<5
	8	<5	<5
	Guideline	31.9	N/A

Date	Sample ID	DIBENZ(A,H)ANTHRACENE	BENZO(G,H,I)PERYLENE	% MOISTURE
August 28th, 2007 Sweep 3	1	<5	14	87.0
	2	<5	15	55.0
	3	<5	<5	85.0
	4	<5	<5	17.0
	5	<5	<5	18.0
	6	<5	<5	55.0
	6	<5	<5	30.0
	7	<5	<5	27.0
	8	<5	<5	20.0
	Guideline	6.22	N/A	N/A

Appendix B – Metals analysis from Dr. Hawboldt's students (Copied directly from preliminary draft report by Hongjing Wu, Yuan Chen, and Mohammad Dadashzadeh, 2008)

Aluminum (Al)

The CCME guideline for aluminum in fresh water samples for the protection of aquatic life is 100 ppb. The results from 2007 shows that all 8 sites are exceeded the CCME guideline with the highest point of 668.1 ppb in site 3. Compared to year 2006, all sites have higher concentration of aluminum in 2007 (Figure 1).

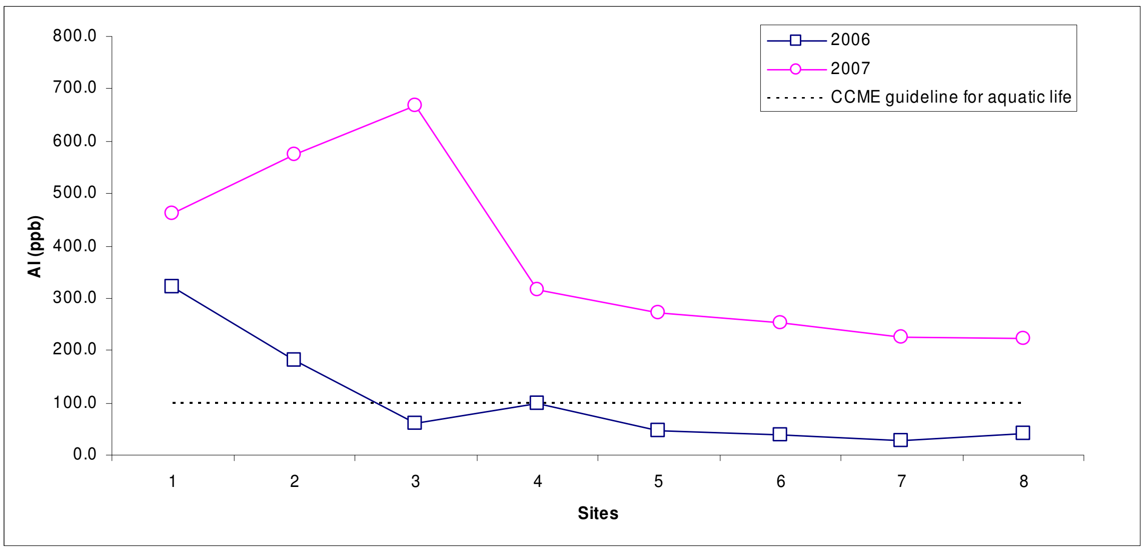

Figure 1: Mean concentration of aluminum (Al) in ppb per sample site in 8 sites water sample, with a with a maximum CCME guideline (for the protection of aquatic life, 2003) of 100 ppb derived according to the relative pH of the samples.

Arsenic (As)

The CCME interim guideline for arsenic in freshwater sediment for the protection of aquatic life (2003) is 5.9 mg/kg. All 8 sites are exceeded the ISQG which the most critical one is the 53.32 g/Kg in site 7. Compared to year 2006, only site 7 has a higher concentration of arsenic in 2007 (Figure 2).

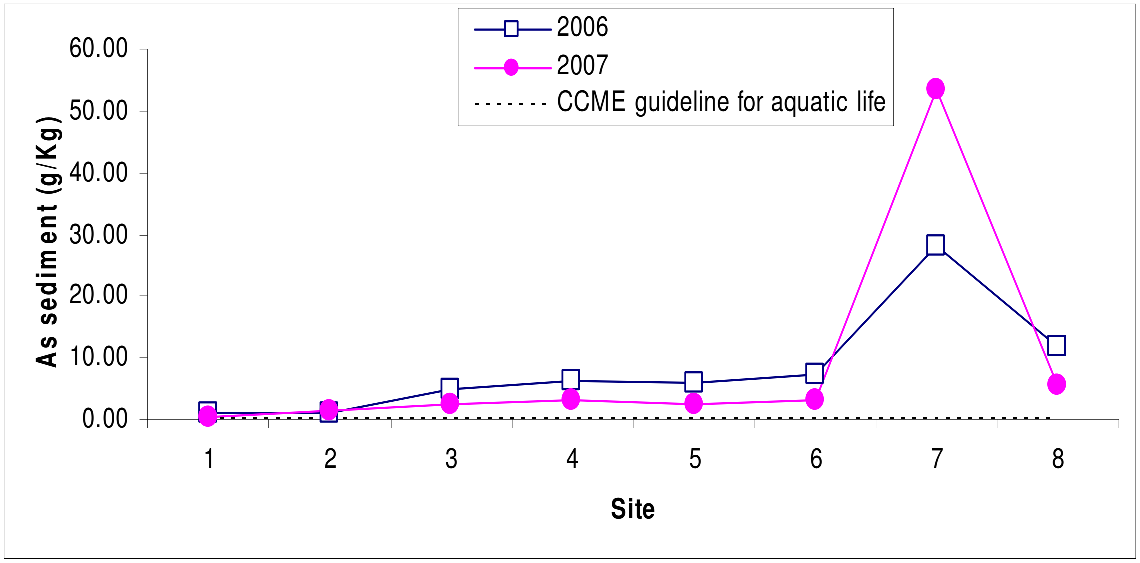

Figure 2: Mean concentration of arsenic (As) in g/Kg per sample site in the 8 sites sediment samples, with a CCME Interim Sediment Quality Guideline (ISQG) of 5.9 mg/Kg (for the protection of aquatic life in freshwater sediments, 2003).

(Author's note, only site 7 showed detectable amounts of As in either 2006 or 2007).

Cadmium (Cd)

The CCME interim guideline for cadmium in freshwater sediment for the protection of aquatic life (2003) is 0.6 mg/L. All 8 sites are exceeded the CCME guideline with the highest point of 0.874 ppb and 0.739 ppb in sites 3 and 6.

Compared to year 2006, sites 1, 2, and 6 have higher concentration of cadmium in 2007 (Figure 4).

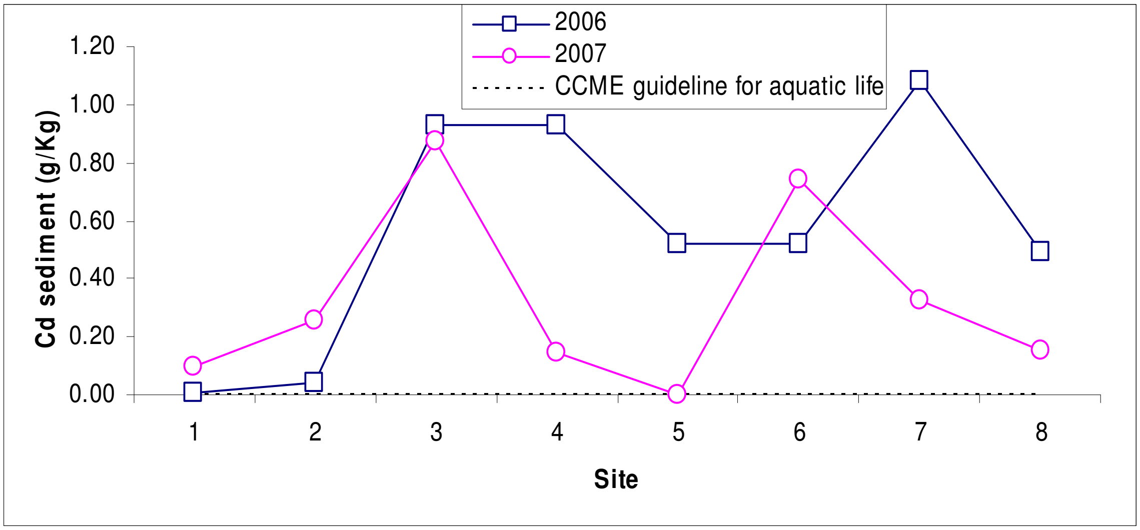

Figure 4: Mean concentration of cadmium (Cd) in g/Kg per sample site in 8 sites sediment sample, with a CCME Interim Sediment Quality Guideline (ISQG) of 0.6 mg/Kg (for the protection of aquatic life in freshwater sediments, 2003)

Copper (Cu)

The CCME guideline for copper in fresh water samples for the protection of aquatic life is 2 ppb with the highest concentration in site 2.

Compared to year 2006, only site 1 has lower concentration of copper in 2007 (Figure 5).

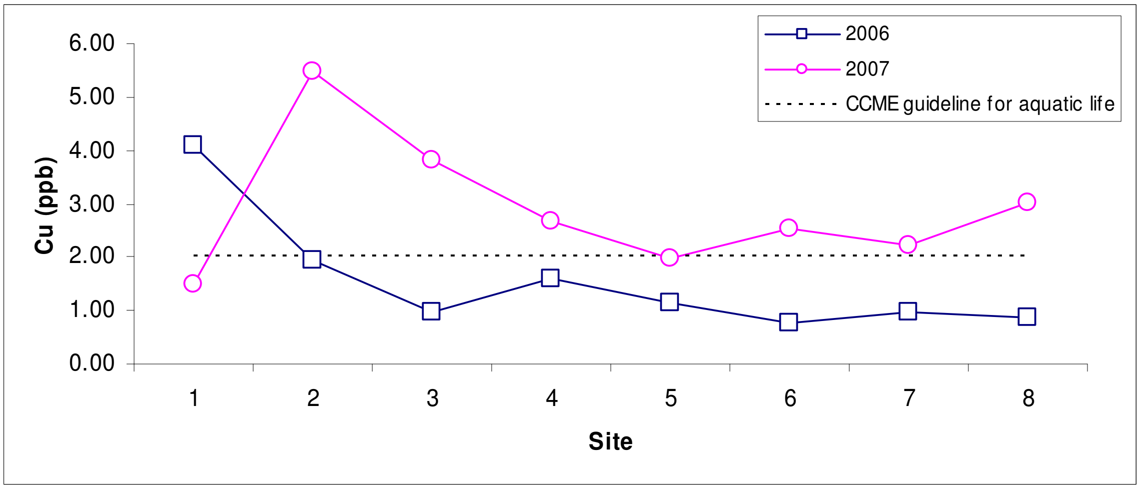

Figure 5: Mean concentration of copper (Cu) in ppb per sample site in 8 sites water sample, with a CCME Guideline (for the protection of aquatic life, 2003) of 2 ppb derived according to the relative hardness of the samples.

The CCME interim guideline for copper in freshwater sediment for the protection of aquatic life (2003) is 35.7 mg/L. All 8 sites have higher levels than CCME guideline.

Compared to year 2006, sites 2 and 4 have higher concentration of copper in 2007 (Figure 6).

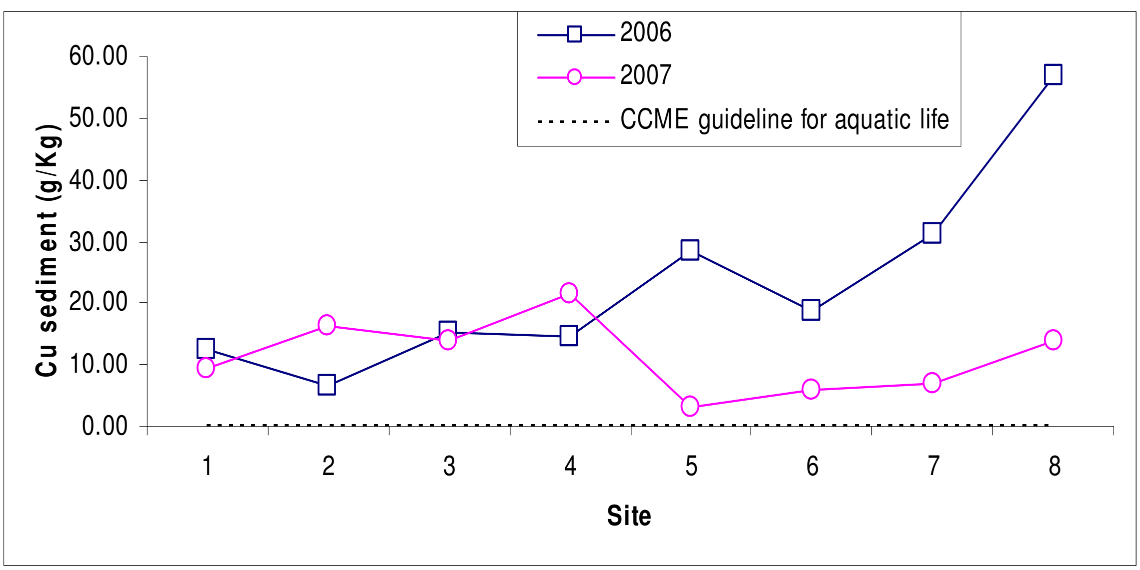

Figure 6: Mean concentration of copper (Cu) in g/Kg per sample site in 8 sites sediment sample, with a CCME Interim Sediment Quality Guideline (ISQG) of 35.7 mg/Kg (for the protection of aquatic life in freshwater sediments, 2003).

Iron (Fe)

The CCME guideline for Iron in fresh water samples for the protection of aquatic life is 300 ppb. All 8 sites have the concentration level of more than that of CCME guideline with the highest concentration is at point 1892 ppb in site 2.

Compared to year 2006, all 8 sites have higher concentration of iron in 2007 (Figure 7).

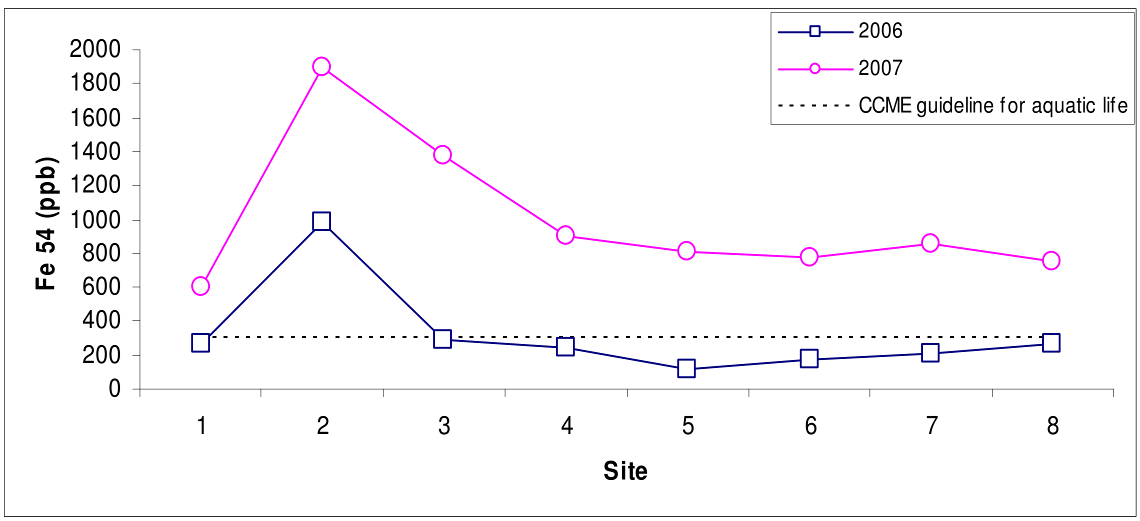

Figure 7: Mean concentration of Iron (Fe) in ppb per sample site in 8 sites water sample, with a CCME Guideline (for the protection of aquatic life, 2003) of 300 ppb derived according to the relative hardness of the samples.

Lead (Pb)

The CCME guideline for lead in fresh water samples for the protection of aquatic life is 1 to 7 ppb depending on different hardness of water. Site 2, 3 and 7 have higher level of lead than that of CCME guideline.

Compared to year 2006, all 8 sites are in higher levels of lead in 2007 (Figure 9).

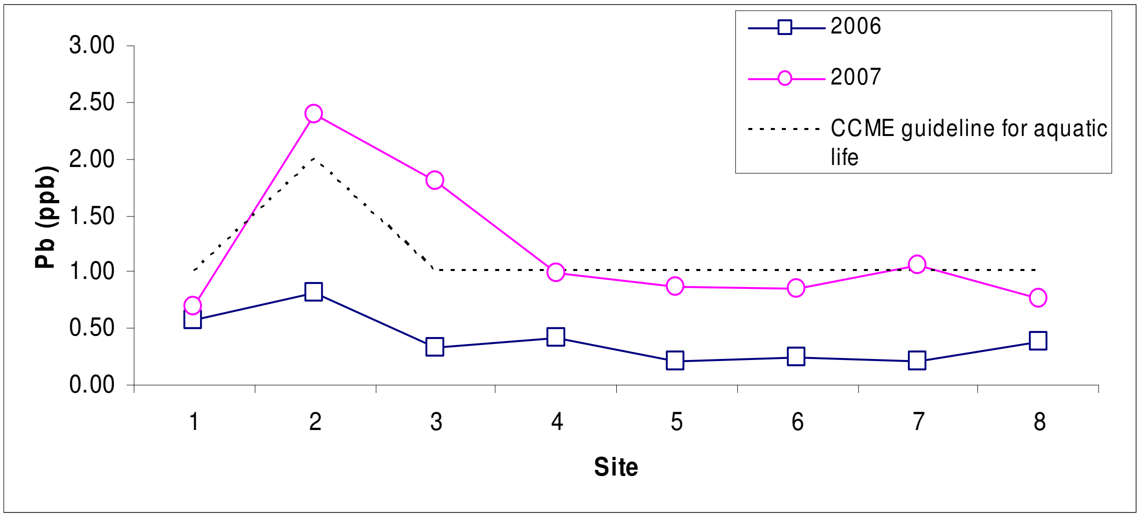

Figure 9: Mean concentration of lead (Pb) in ppb per sample site in 8 sites water sample, with a CCME Guideline (for the protection of aquatic life, 2003) of 1-7 ppb retrieved according to different hardness of water.

The CCME interim guideline for Pb in freshwater sediment for the protection of aquatic life (2003) is 35 mg/L. All 8 sites have higher level than CCME guideline. And the highest level is at the point of 58.02 g/Kg in site 1 which is the reference site.

Compared to year 2006, only site 1 has a higher concentration of lead in 2007 (Figure 10).

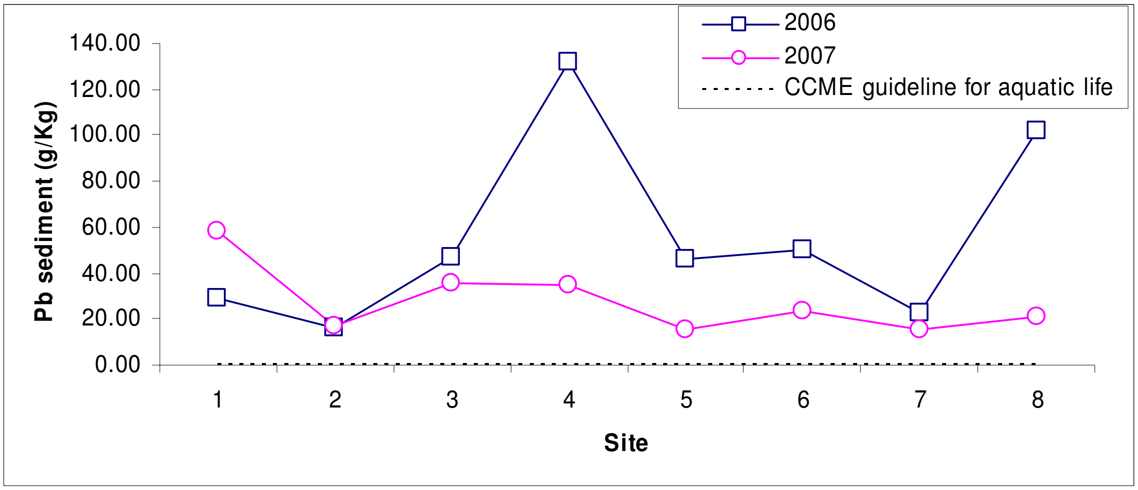

Figure 10: Mean concentration of lead (Pb) in g/Kg per sample site in 8 sites sediment sample, with a CCME Interim Sediment Quality Guideline (ISQG) of 35 mg/Kg (for the protection of aquatic life in freshwater sediments, 2003)

Zinc (Zn)

The CCME guideline for zinc in fresh water samples for the protection of aquatic life is 123 mg/kg. All 8 sites have higher level than CCME guideline with the highest level of 170.77 mg/kg in site 4.

Compared to year 2006, sites 1, 2, 4 and 6 have higher concentration of zinc in year 2007 (Figure 11).

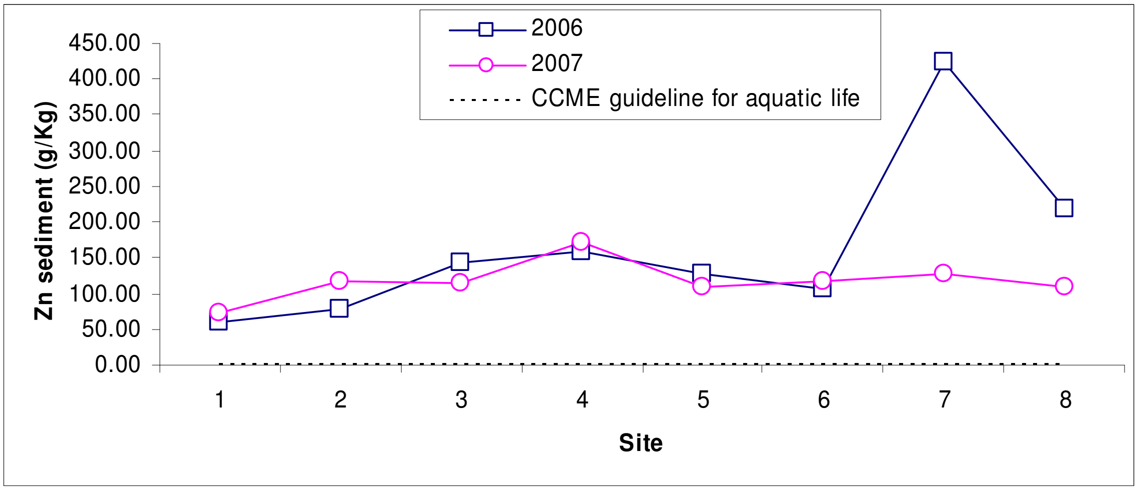

Figure 11: Mean concentration of Zinc (Zn) in ppb per sample site in 8 sites water sample, with a CCME Guideline (for the protection of aquatic life, 2003) of 123 mg/kg.