Government of Newfoundland and Labrador

VOISEY'S BAY NICKEL COMPANY LIMITED

A subsidiary of Inco Limited

Voisey's Bay Real-Time Water Quality Monitoring Network Annual Report 2005

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Acknowledgements

The Real-Time Water Quality Monitoring Network in Voisey's Bay is successful in tracking emerging water quality issues due to the hard work and diligence of certain individuals. The management and staff of Voisey's Bay Nickel Company Limited (VBNC) work in cooperation with the management and staff of the Department of Environment and Conservation (DOEC) as well as Environment Canada (EC) to ensure the protection of ambient water resources in Voisey's Bay.

The VBNC Environmental Officers on-site, Perry Blanchard and Paul Hounsell, work to ensure the Real-Time Water Quality Monitoring Network is operating to the standards set by DOEC. It is only through their dedication to properly maintain and calibrate the equipment that the data can be viewed as reliable and accurate.

Numerous individuals from DOEC have been integral in ensuring the smooth operation of such a technologically advanced network. Annette Tobin has taken on the role of coordinator and liaison between the major agencies involved, thus, ensuring open communication lines at all times. In addition, Annette is responsible for the data management/reporting along with ensuring the quality assurance/quality control measures are satisfactory. Kent Slaney, Joanne Sweeney, Paula Dawe and Annette Tobin have travelled to Voisey's Bay to ensure all procedures were being followed and to provide technical assistance. Paul Neary and Amir Ali Khan have worked on the communication aspects of the network ensuring the data is being provided to the general public on a near real-time basis through the departmental web page. Finally, Rob Holloway has enhanced the network by providing a GIS component to the project with the development of topographic/basin maps; digital elevation model maps; slope maps and satellite imagery maps.

The staff of EC under Meterological Service of Canada Water Survey Canada (Percy Roberts, Perry Pretty, Bill Mullins and Brent Ruth) play an essential role in the data logging/communication aspect of the network. These individuals visit the site often to ensure the data logging equipment is operating properly and transmitting the data efficiently. Finally, they play the lead role in dealing with hydrological quantity and flow issues.

The managers from each agency (Earl Dwyer – VBNC; Haseen Khan – DOEC; Howie Wills – EC) are fully committed to improving this network and ensuring it provides meaningful and accurate water quality/quantity data that can be used in the decision-making process. This network is only successful due the cooperation of all three agencies involved.

Section 1.0 Introduction

The Real-Time Water Quality Monitoring Network was first established in Voisey's Bay during the summer of 2003. There were three real-time water quality stations established on some of the main water bodies within the vicinity of the Voisey's Bay development. The locations of the three stations (**Upper Reid Brook – 03NE001**; **Camp Pond Brook – 03NE002**; **Lower Reid Brook – 03NE011**) can be seen in Figure 1 below.

The selection of these particular sites was an involved process whereby the water quality instruments were placed in areas that would provide meaningful data. The Upper Reid Brook station was chosen to represent the control station due to the pristine nature of the water body with no developmental impacts. The Camp Pond Brook station was chosen as a site that would capture any emerging water quality events due to the nearby development of the mine/mill site. Finally, the Lower Reid Brook station was chosen as a downstream location that could be used to determine if water quality events from the upstream development area were still having an impact downstream just before the stream runs into the ocean. In addition, the Lower Reid Brook station was also chosen to capture direct impacts on water quality as the development moves down closer to this station in the upcoming years.

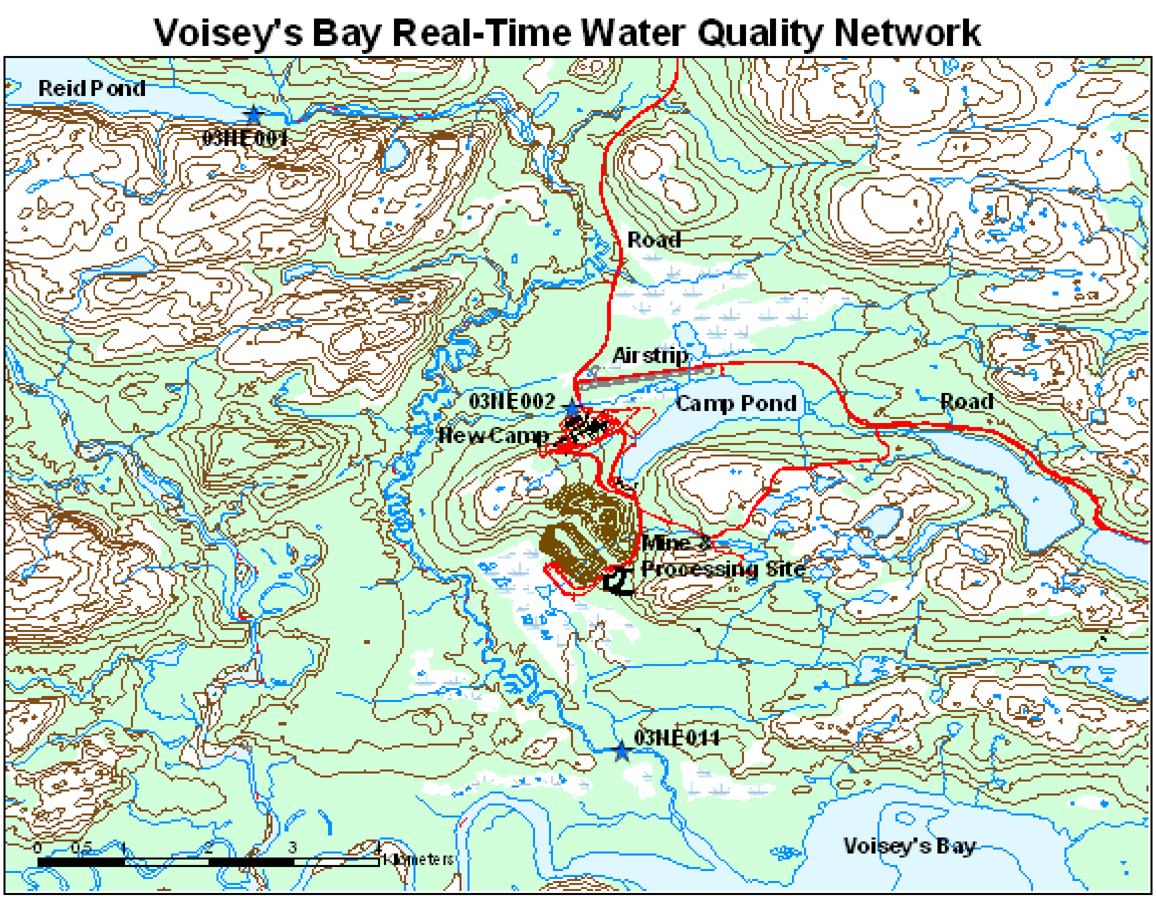


Figure 1: Real-Time Water Quality Station Locations

Working together, VBNC, DOEC and EC staff carried out the initial deployment during the summer of 2003. For the first season, the water quality monitoring instruments were deployed from July – November at which point the rivers began to freeze and the instruments were removed for the winter months. The first season of operation proved to be very successful with many lessons learned on how to more efficiently and effectively operate the network.

In the summer of 2004, the instruments were deployed from July-November at which time the instruments were removed for the winter due to ice conditions. The instruments were sent to the manufacturer for a two year inspection and any warranty work required. They were then stored for the winter until May when they were checked and calibrated by DOEC staff before being shipped them back to Voisey's Bay.

In the spring of 2005, when the ice began to break apart, it was decided that the instruments should be returned to the water. The instruments were deployed on May 31, 2005 by EC and VBNC staff. The results for the 2005 deployment period are discussed in greater detail in Section 3.0.

There was a problem at Upper Reid Brook with the transmission of data to the satellite. The transfer of data was set at a time interval that did not allow all data to be transferred from the datalogger to the satellite system. This issue affected transmissions of data for turbidity and dissolved oxygen parameters. The problem with the timing of the transmission was rectified on July 21st when EC and DOEC staff travelled to Voisey's Bay. The data for the missing time period was downloaded from the datalogger when EC and DOEC visited on September 25th. This data was reviewed by DOEC staff to ensure that a water quality incident had not occurred during that time period.

In July and September 2005, both EC and DOEC staff travelled to Voisey's Bay to ensure that the proper procedures were being followed and at the same time to provide technical assistance to the VBNC staff.

In November 2005, the rivers began to freeze and the instruments were removed on November 9th for the winter months.

Section 2.0 Maintenance/Calibration

It is recommended by DOEC that regular maintenance/calibration take place on a monthly basis in order to ensure accuracy of the data from the real-time water quality monitoring stations. **Table 1** identifies the dates that the instruments were removed/reinstalled for regular maintenance and calibration in 2005. It is important to note that some deployment periods were longer than thirty days due to such issues as availability of helicopters to get to remote locations; timing of site visits from EC and DOEC staff; etc.

Table 1: Dates of Maintenance/Calibration of Instruments

Station	Installation	Removal	Total # of Days	Remarks
Upper Reid Brook	May 31, 2005	July 20, 2005	51	Extended deployment to correspond the maintenance/calibration with the site visit by EC and DOEC staff
	July 21, 2005	September 25, 2005	67	Extended deployment to correspond the maintenance/calibration with the site visit by EC and DOEC staff
	September 26, 2005	November 9, 2005	45	Extended deployment to allow more data collection before removal for winter months
Camp Pond Brook	May 31, 2005	July 20, 2005	51	Extended deployment to correspond the maintenance/calibration with the site visit by EC and DOEC staff
	July 21, 2005	September 25, 2005	67	Extended deployment to correspond the maintenance/calibration with the site visit by EC and DOEC staff
	September 26, 2005	November 9, 2005	45	Extended deployment to allow more data collection before removal for winter months
Lower Reid Brook	May 31, 2005	July 20, 2005	51	Extended deployment to correspond the maintenance/calibration with the site visit by EC and DOEC staff
	July 21, 2005	September 25, 2005	67	Extended deployment to correspond the maintenance/calibration with the site visit by EC and DOEC staff
	September 26, 2005	November 9, 2005	45	Extended deployment to allow more data collection before removal for winter months

Section 3.0 Data Interpretation

Upper Reid Brook

As stated in the introduction, the Upper Reid Brook site was chosen to represent a control station that is not directly impacted by development. Throughout the deployment period form May to November 2005, the water quality remained pristine.

As can be seen in **Figures 1a and 1b**, the pH of the water at the Upper Reid Brook station remained very consistent throughout the deployment period with the exception of the end of the deployment period. Generally, Upper Reid Brook demonstrates a background pH of approximately 6.5 pH units. The spikes seen at the end of the deployment period are not likely due to a water quality event. It is likely that the probe was beginning to get affected by the cold water temperatures. The breaks in the graph in Figure 1a indicate the periods when the instrument was out of the water for maintenance/calibration purposes.

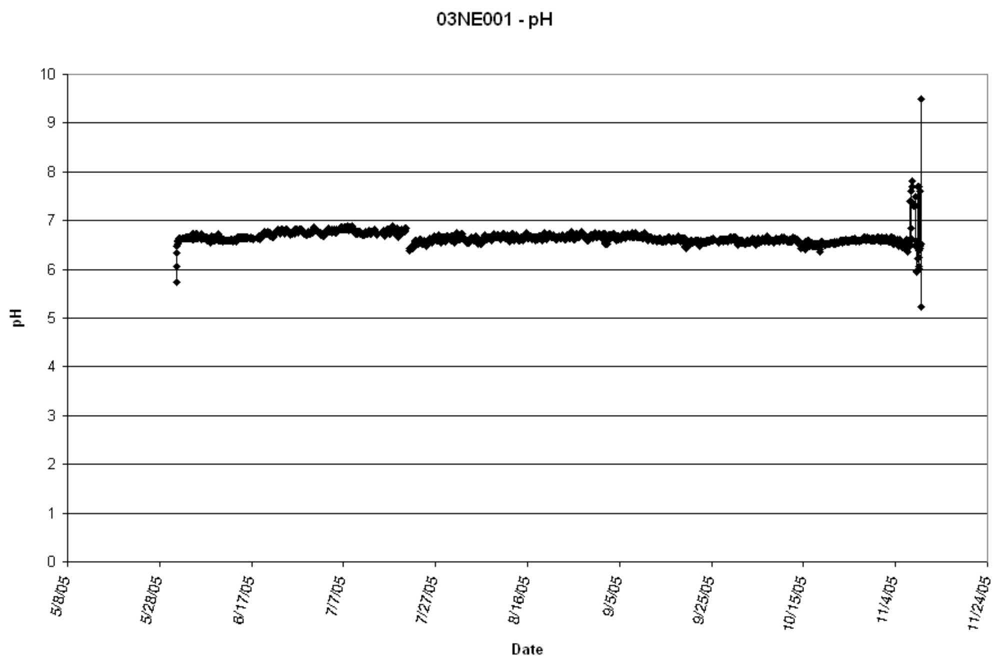


Figure 1a

Figures 2a shows that the conductivity of the water at the Upper Reid Brook station remained very consistent throughout the deployment period. Generally, Upper Reid Brook demonstrates a very low background conductivity of approximately 7 to 9 µS/cm. There was a drop in conductivity when the instrument was reinstalled in September. The spikes seen at the end of the deployment period are not likely due to a water quality event. It is likely, as with the pH readings, that the probe was beginning to get affected by the cold water temperatures. The breaks in the graph in Figure 1a indicate the periods when the instrument was out of the water for maintenance/calibration purposes.

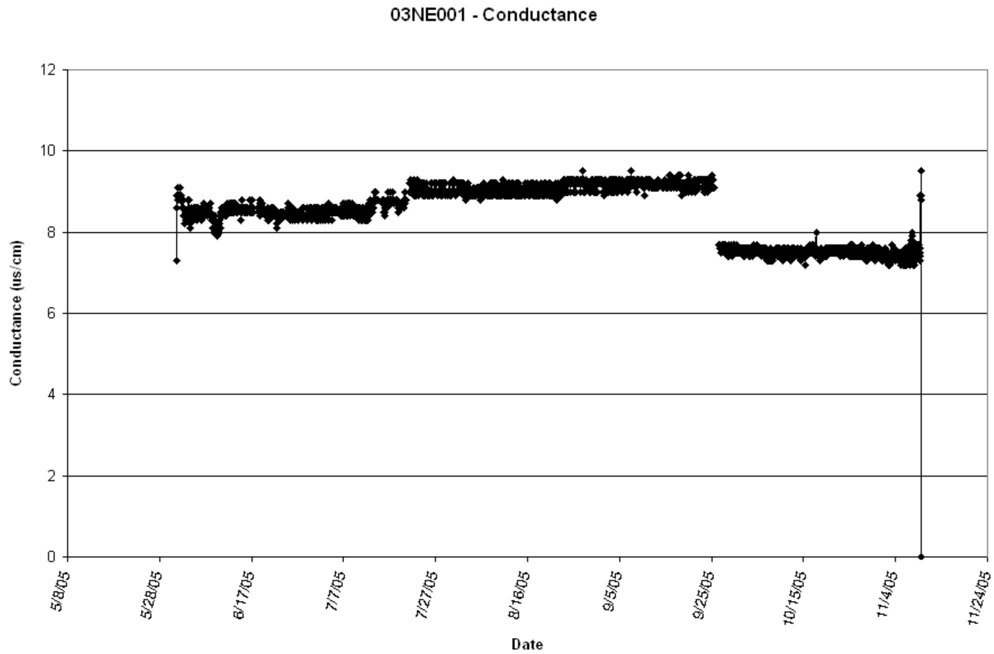


Figure 2a

As can be seen in **Figures 3a and Figures 4a,** the dissolved oxygen of the water at the Upper Reid Brook station demonstrated an expected increase as the water temperature decreased throughout the deployment period. This corresponds with the natural ability of water to have higher concentrations of dissolved oxygen when lower water temperatures are present. The breaks in the graph in Figure 3a and 4a indicate the periods when the instrument was out of the water for maintenance/calibration purposes.

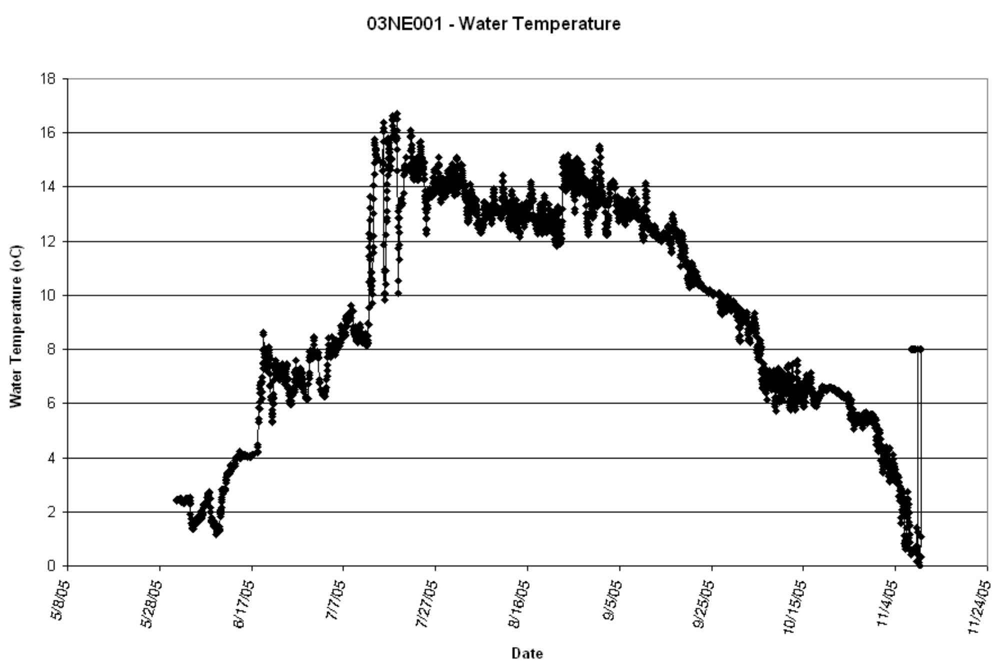


Figure 3a

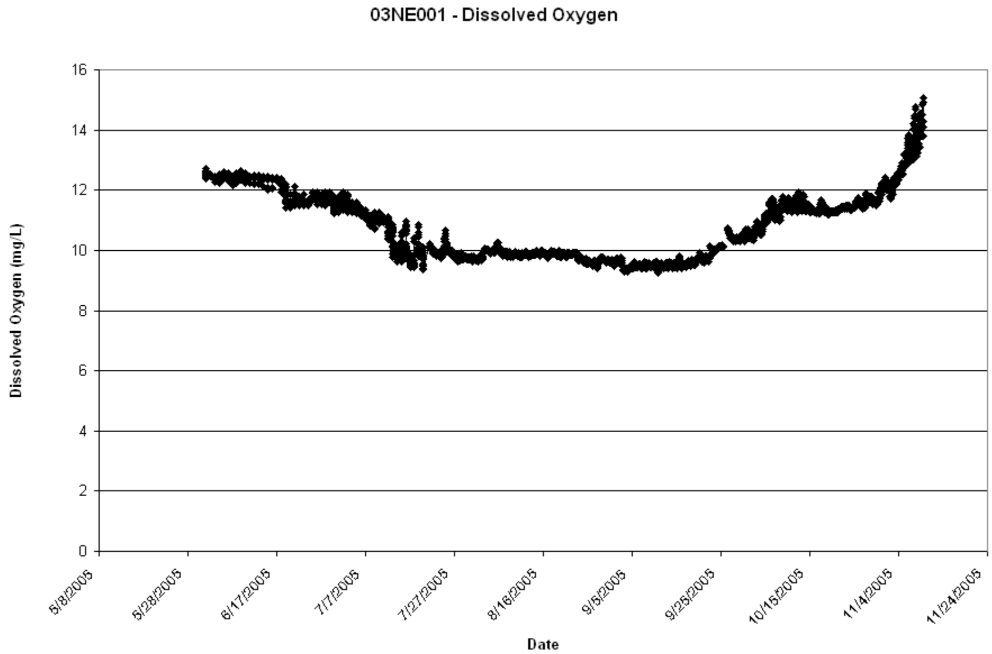


Figure 4a

As can be seen in **Figures 5a** the turbidity of the water at the Upper Reid Brook station remained consistently low throughout the deployment period. The spikes seen at the end of the deployment period are not likely due to a water quality event. As with pH and conductivity readings, it is likely that the probe was beginning to get affected by the cold water temperatures. **Figure 5b** shows the conductance with the scale changed to view normal turbidity ranges. Turbidity values are typically in the range of 0-5 NTU. The low turbidity values are a clear indication that the water is not being impacted by development.

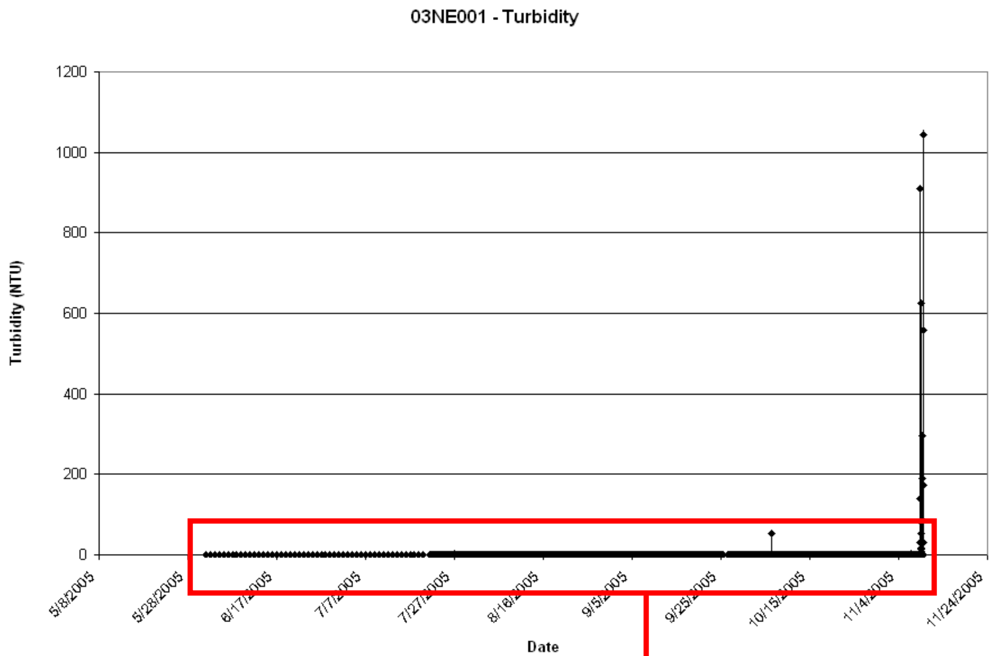


Figure 5a

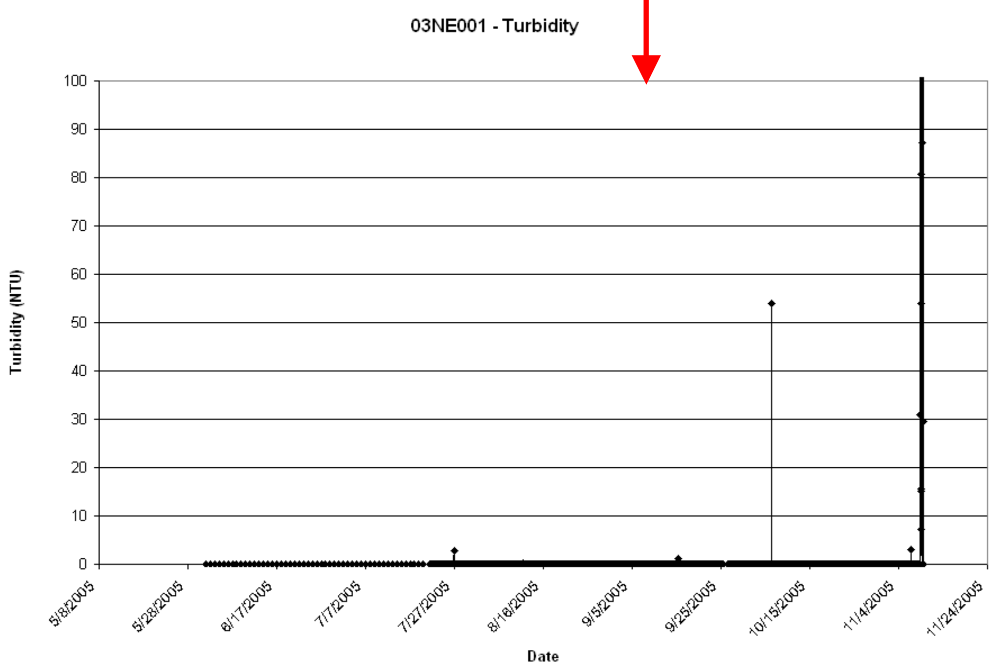


Figure 5b

Overall, the Upper Reid Brook station displayed very consistent values for all major parameters over the deployment period. Upper Reid Brook is a pristine water body that can be used successfully as a control station to determine the natural background levels expected in the Voisey's Bay area.

Camp Pond Brook

As stated in the introduction, the Camp Pond Brook site was chosen to capture any emerging water quality events due to the nearby development of the mine/mill site.

As can be seen in **Figure 6a**, the pH of the water at the Camp Pond Brook station remained very consistent throughout the deployment period with the exception of two days in September – the 18th and 19th (or some other rephrasing) (**Figure 6b**). This increase to pH 12.19 was consistent with a spill that occurred from a tailings pipe that was reported on September 19th. Water with a pH of 12 was released from the tailings pipe and caused both pH and conductance to increase in Camp Pond Brook for a short period of time. Generally, Camp Pond Brook demonstrates background pH of 7.0 pH units. There was a slight change in pH after the instrument was cleaned/calibrated in late September. The drops to zero in the graph in Figure 6a indicate the periods when the instrument was out of the water for maintenance/calibration purposes. The pH of the Camp Pond Brook station is slightly higher than that of the control station (Upper Reid Brook) which may possibly be attributed to the nearby development.

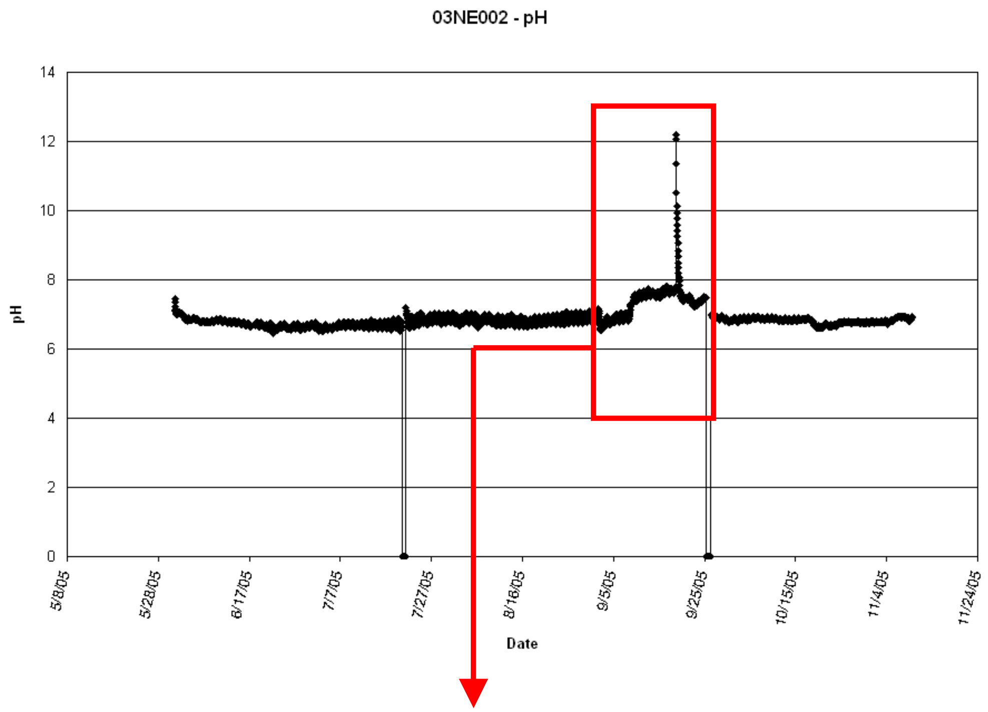


Figure 6a

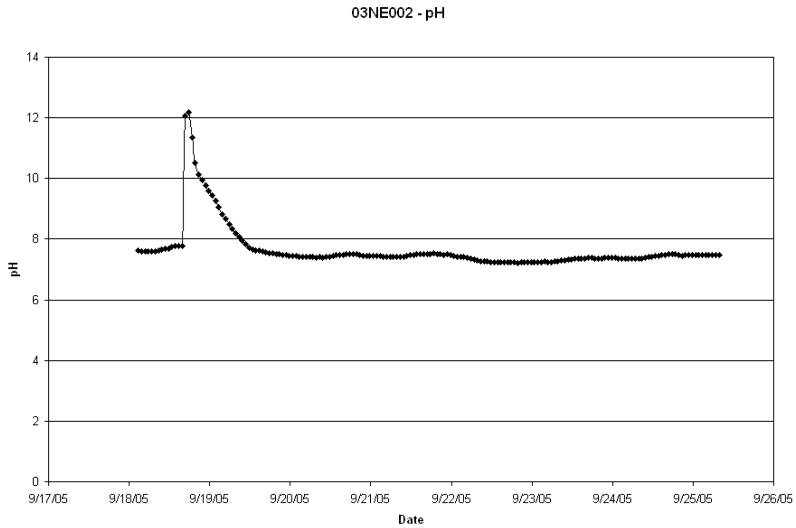


Figure 6b

As can be seen in **Figure 7a**, the conductivity of the water at the Camp Pond Brook station remained very consistent throughout the deployment period with the exception of September 18-19th (**Figure 7b**). The conductivity values of Camp Pond Brook generally remained in the range of approximately 20 to 30 µS/cm. This range is slightly higher than that of the control station (Upper Reid Brook) but is expected due to the level of development surrounding Camp Pond Brook. The drops to zero in the graph in Figure 7a indicate the periods when the instrument was out of the water for maintenance/calibration purposes.

On September 18-19th, the spike seen in **Figure 7b** is consistent with a spill that occurred from a tailings pipe that was reported on September 19th, as discussed in the discussion of pH above. Water with a pH of 12 was released from the tailings piping and caused both pH and conductance to increase in Camp Pond Brook for a short period of time. **Figure 7c** shows the conductance with the scale changed to show the additional spike in conductance on September 19th. These spikes were likely due to the tailing pipe releases.

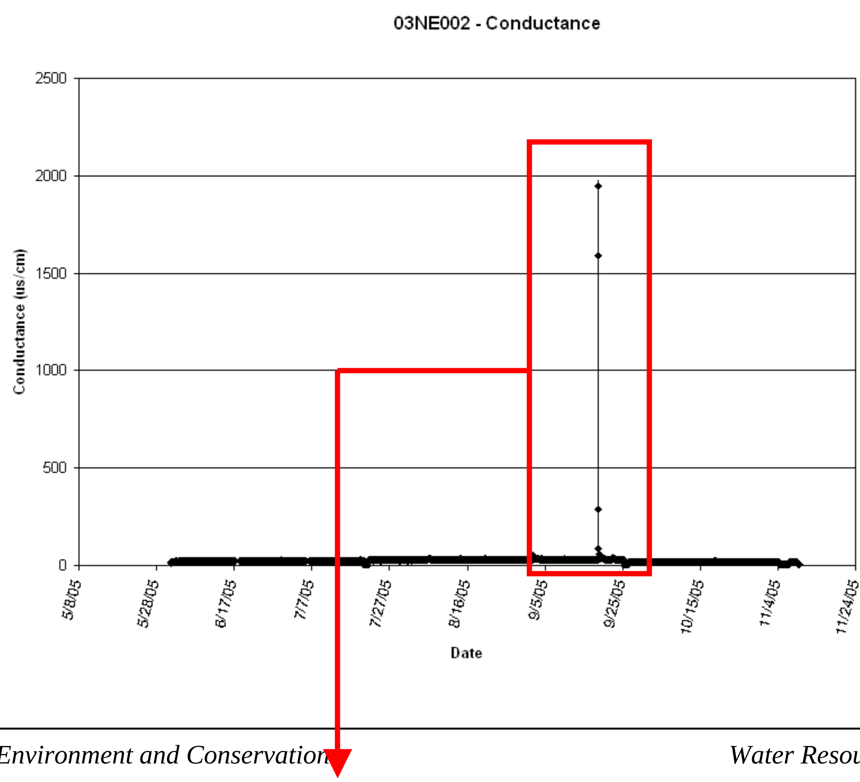
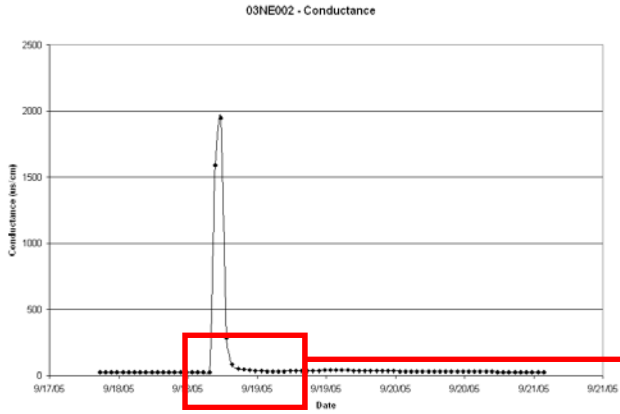


Figure 7a



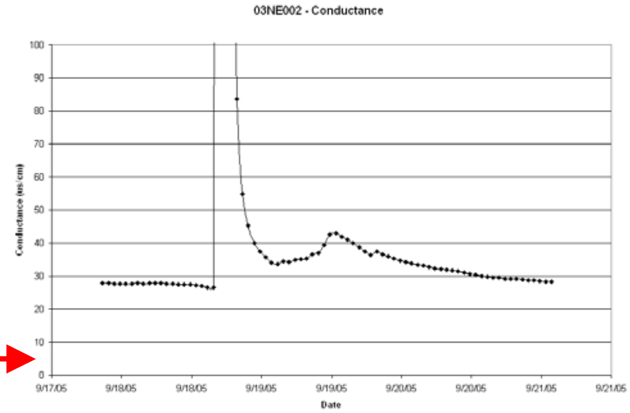


Figure 7b **Figure 7c**

As seen in **Figure 8a** and **Figure 9a**, the dissolved oxygen over the deployment period shows an expected decrease as temperature increases. This corresponds with the natural ability of water to have higher concentrations of dissolved oxygen when lower water temperatures are present. The slight decreases in dissolved oxygen from time to time correspond with an increase in water temperature. The drops to zero in the graphs in Figure 8a and 9a indicate the periods when the instrument was out of the water for maintenance/calibration purposes.

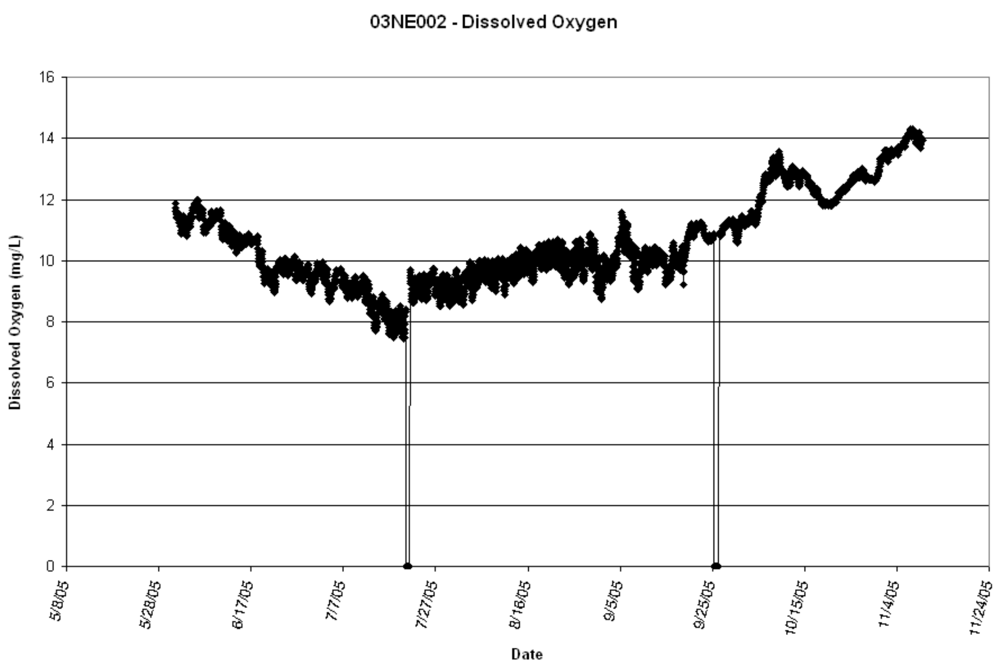


Figure 8a

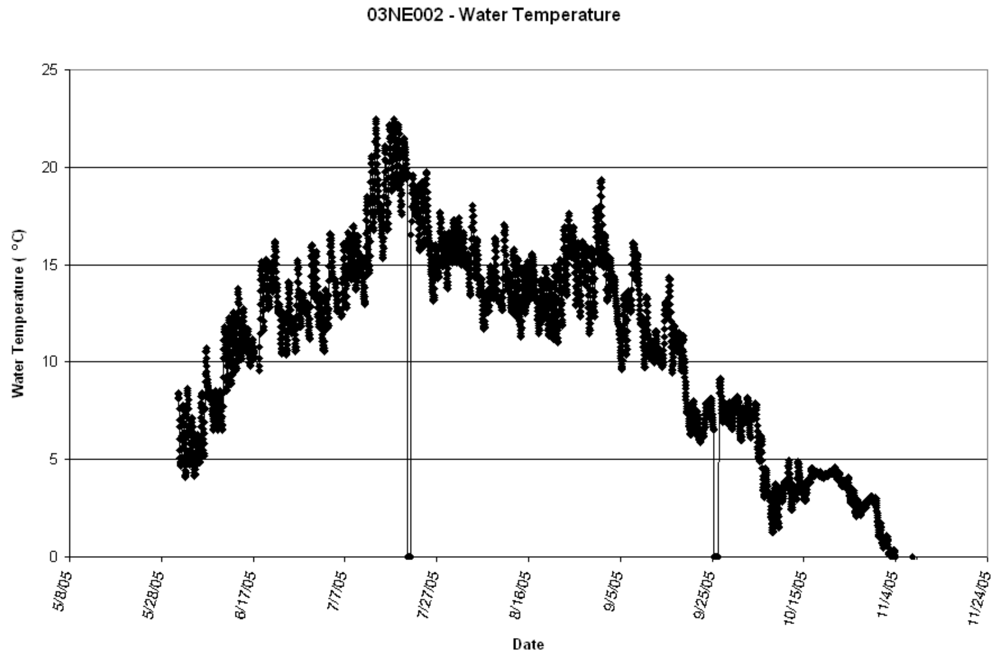


Figure 9a

Figure 10a shows turbidity values for Camp Pond Brook over the deployment period. With the exception of the period between August and September, turbidity values were relatively stable, ranging between 0 and 20 NTU. **Figure 10b** shows the turbidity with the scale changed to more clearly see the turbidity variations. Sporadic spikes were seen throughout the deployment period, but usually consisted of only a couple one-hour intervals. Throughout the end of August and the first half of September there was significant activity experienced at the Camp Pond Brook stations for turbidity (**Figure 10c**). There was a severe increase in turbidity from August 24th to September 16th. After September 16th the turbidity was still fluctuating but showed a decrease until approximately September 22nd. Between September 18th and September 22nd, the fluctuations in turbidity ranged from 1 NTU to 1669 NTU. This corresponds to the tailings pipe leak discussed earlier with respect to pH and conductance. The increases that were seen earlier in August and September may be associated with leakages from the tailings pipe that eventually spilled on September 18th. An increase in turbidity began again on September 22nd until the Hydrolab was removed for maintenance/calibration purposes on September 25th. The drops to zero in the graph in **Figure 10a**, **10b** and **10c** indicate the periods when the instrument was out of the water for maintenance/calibration purposes.

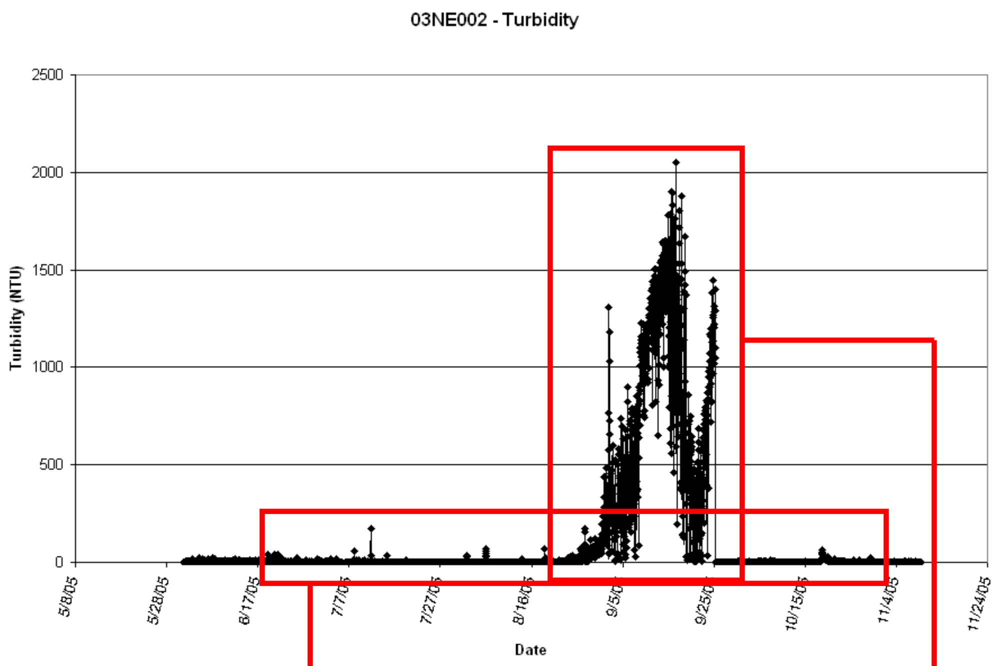


Figure 10a

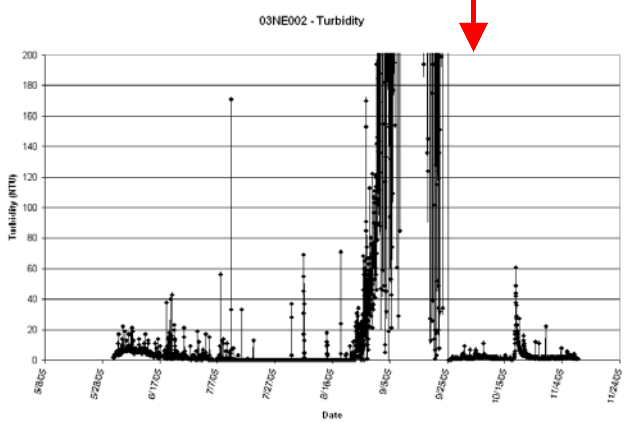


Figure 10b

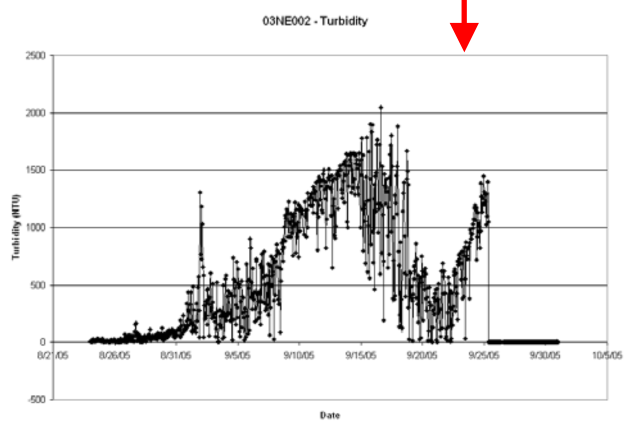


Figure 10c

Overall, the Camp Pond Brook station displayed consistent values for all major parameters over the deployment period with the exception of the water quality event that occurred on between August 24th to September 22nd due to the spill of the tailing pipe. The overall range of pH, conductivity and turbidity values are slightly above those recorded at the control station (Upper Reid Brook). In the case of Camp Pond Brook, the real-time water quality monitoring network played a significant role in capturing the emerging issues as they happened, which allowed the VBNC staff to respond quickly and efficiently.

Lower Reid Brook

As stated in the introduction, the Lower Reid Brook site was chosen as a downstream location that could be used to determine if water quality events from the upstream development area were still having an impact downstream, just before the stream runs into the ocean. Throughout the deployment period from May to November 2005, the water quality at this station was slightly more variable than both the Upper Reid Brook and Camp Pond Brook stations.

As can be seen in **Figure 11a**, the pH of the water at the Lower Reid Brook station was fairly consistent throughout the deployment period, with the pH values remaining around the 7 pH units mark. This range of pH values is slightly higher than that of the control station (Upper Reid Brook) but very similar to that of the Camp Pond Brook station. The month of October showed a decrease in pH below 7.0 pH units. The drop to zero in the graph in **Figure 11a** indicates the period when the instrument was out of the water for maintenance/calibration purposes.

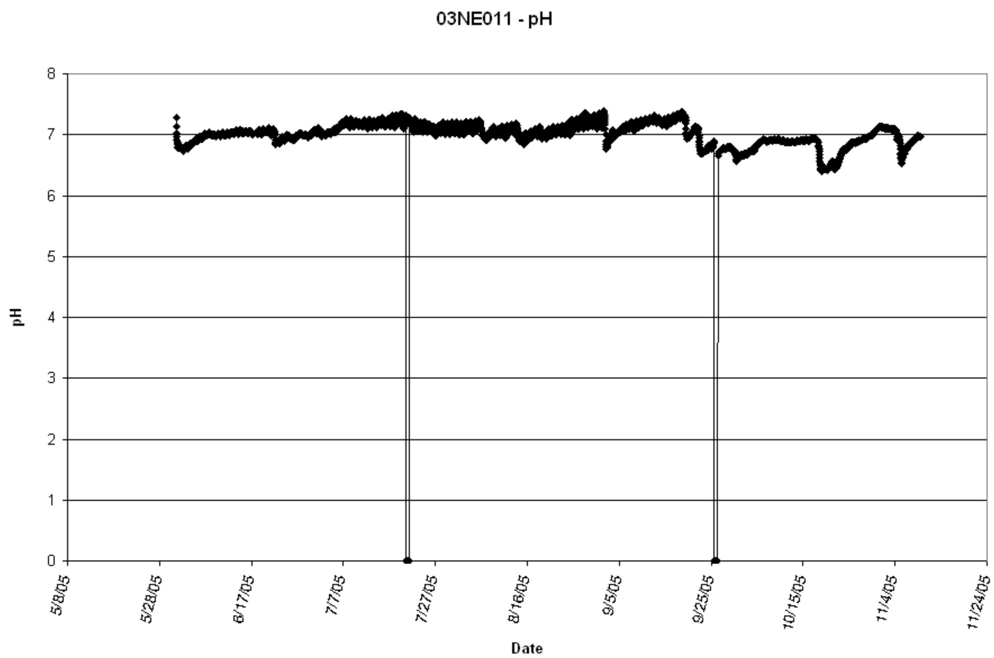


Figure 11a

Figure 12a shows that the conductivity of the water at the Lower Reid Brook station was increasing throughout much of the deployment period. Conductivity increased from initial deployment until September 19th and then dropped to approximately 18 us/cm. Two spikes were seen after this initial drop in September. The range of conductivity was between 10 and 40 us/cm. Again, this range is higher than that of the control station (Upper Reid Brook), however, it is very similar to that of the Camp Pond Brook station. The drop to zero in the graph in **Figure 12a** indicates the period when the instrument was out of the water for maintenance/calibration purposes.

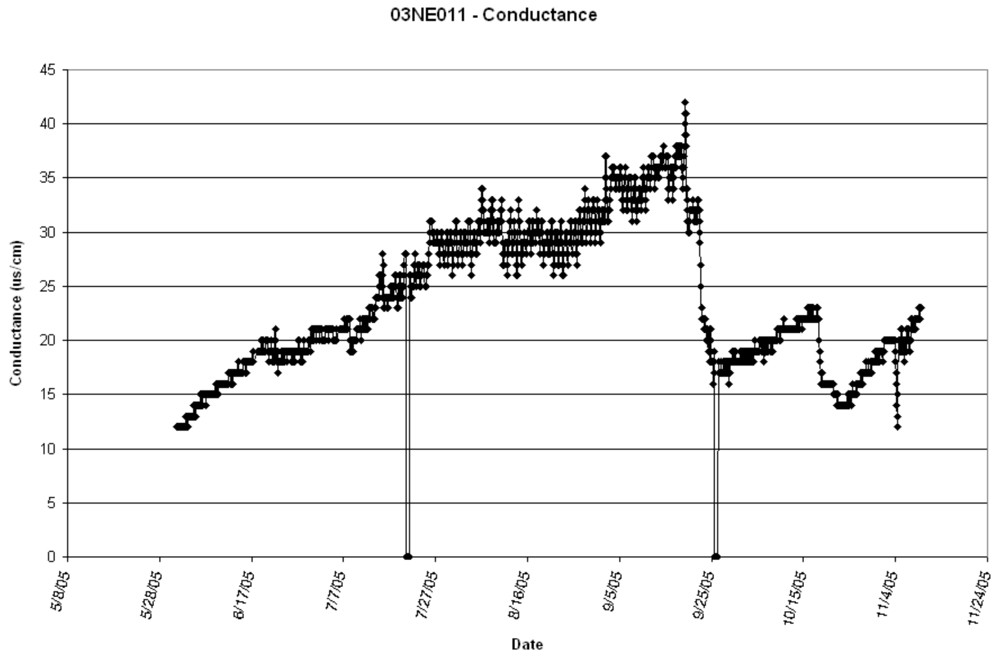


Figure 12a

As can be seen in **Figures 13a** and **14a**, the dissolved oxygen of the water at the Lower Reid Brook station demonstrated an expected decrease as the water temperature increased throughout the deployment period. The drop to zero in the graph in Figure 13a and 14a indicates the period when the instrument was out of the water for maintenance/calibration purposes.

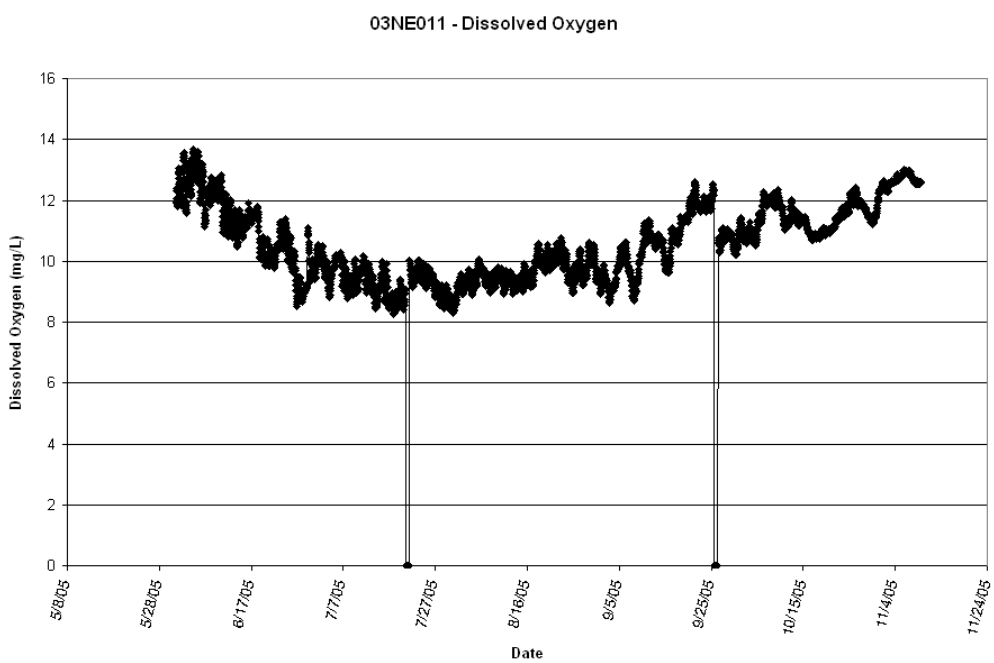


Figure 13a

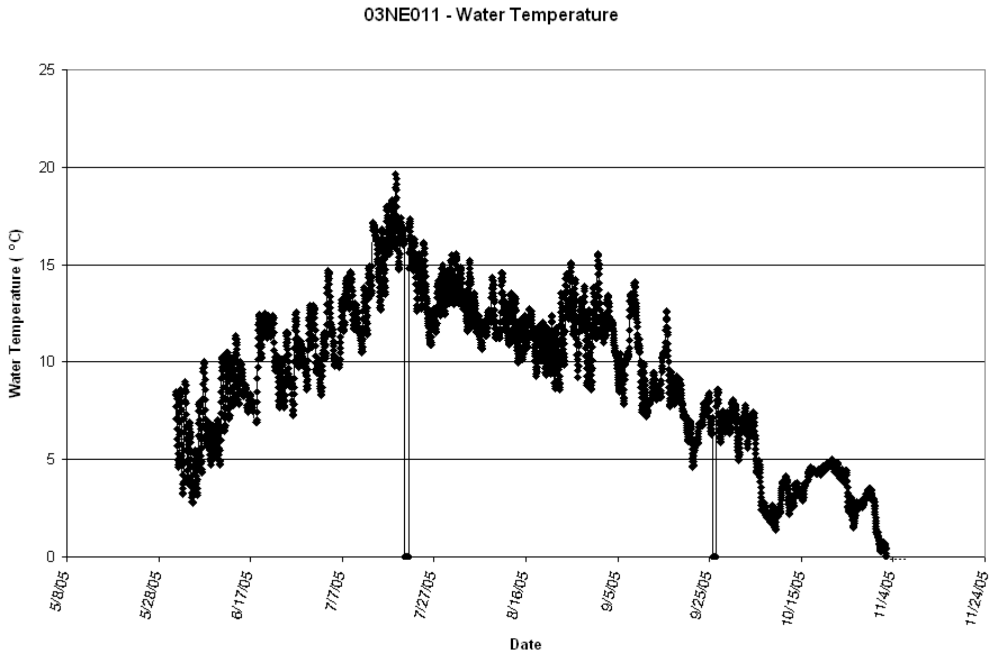


Figure 14a

As can be seen in **Figure 15a,** the turbidity of the water at the Lower Reid Brook station showed sporadic spikes throughout the deployment period. **Figure 15b** shows the turbidity with the scale changed to show turbidity activity without the influence of one specific incident mentioned below. These spikes typically occurred for only a couple of hours at a time. During the period of time between September 2nd and September 20th, the turbidity increased drastically to the maximum of 3000 NTU on September 9th. The increase in turbidity began approximately 7 days after the turbidity in Camp Pond Brook began to increase. On September 20th, the turbidity values suddenly decreased (within an hour) from the maximum 3000 NTU to background levels of 0-6 NTU. The increases seen here are likely due to the leaking of the tailings pipe.

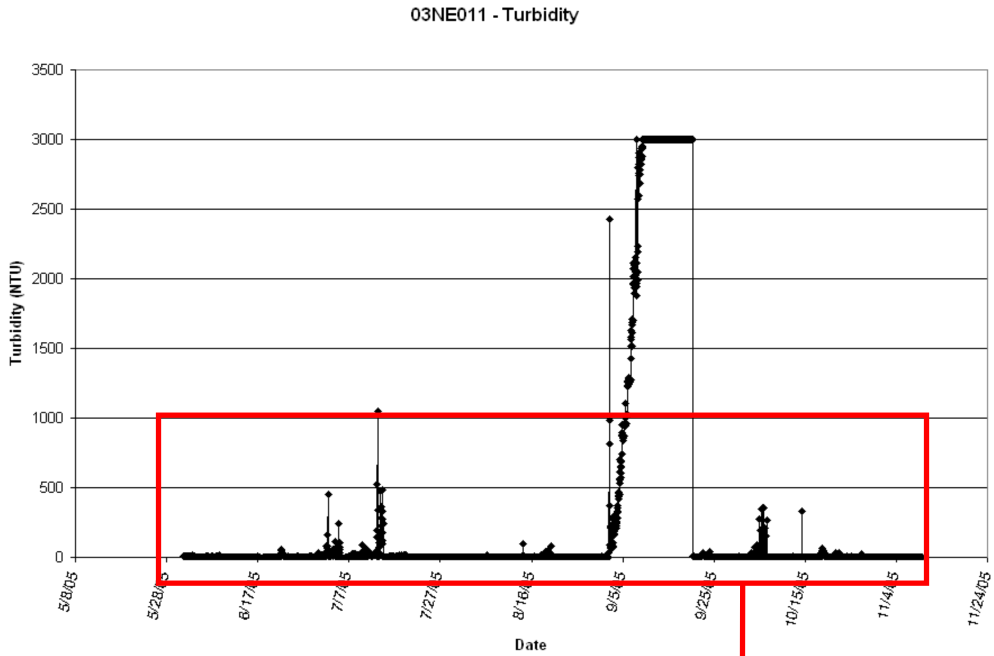


Figure 15a

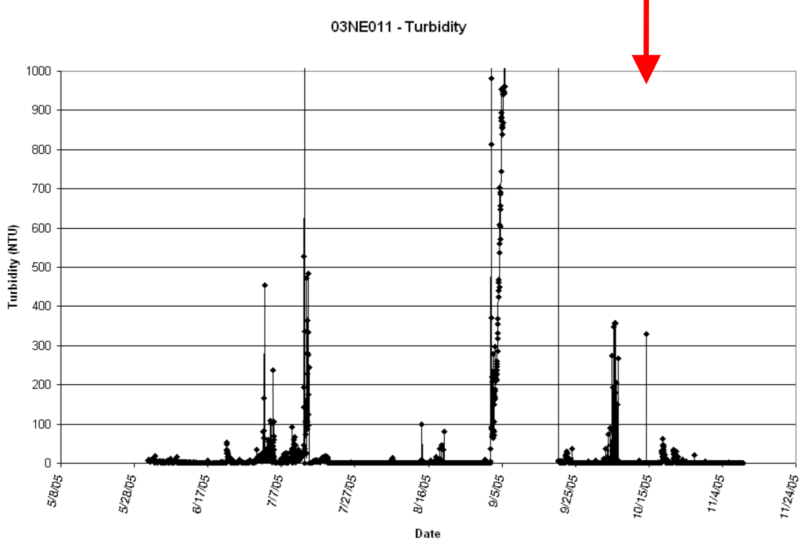


Figure 15b

Overall, the Lower Reid Brook station displayed fairly consistent values for all major parameters during the deployment period with the exception of turbidity values during the month of September. Parameters are typically slightly higher than the control site, Upper Reid Brook, but similar to Camp Pond Brook.

Section 4.0 Quality Assurance/Quality Control (QA/QC) Measures

Quality Assurance/Quality Control (QA/QC) measures are a very important aspect of the Real-Time Water Quality Monitoring Network in Voisey's Bay. These measures are put in place to ensure that the instruments are reading data accurately. The QA/QC procedures established by DOEC are two-fold:

1) Data from the water quality monitoring instrument in-situ (Datasonde) are compared to data from a portable instrument in-situ (Minisonde) at the time of redeployment after maintenance/calibration procedures have been performed; data must fall within a specified range. **Table 2** summarizes the QA/QC results comparing the Datasonde readings against the Minisonde readings for each real-time water quality station.

2) Grab water samples are taken from each station at the time of redeployment and sent to a laboratory for analysis; the results are then compared to those of the water quality monitoring instrument in-situ (Datasonde); data must fall within a specified range. **Table 3** summarizes the QA/QC results comparing the Datasonde readings against the laboratory readings (only three readings available from the lab for comparison – pH; conductivity; total dissolved solids).

As can be seen in **Table 2**, the QA/QC comparison between the Datasondes and the Minisonde at the time of redeployment for all stations is generally good or excellent. One problem encountered was that on May 31st, 2005 no Minisonde readings were taken at any of the stations for comparison purposes. This was because the Minisonde was not sufficiently charged at the time, a fact which was not discovered by the Environmental Officer until arrival in the field.

There was a problem with QA/QC values on September 26, 2005 with temperature, conductivity and dissolved oxygen. The QA/QC comparisons for Upper Reid Brook (temperature, conductivity) and Lower Reid Brook (temperature, conductivity and dissolved oxygen) were rated as poor. This may be due to the fact that the probes were beginning to be affected by the cold water temperature. The Minisonde and three Datasondes will be sent to the manufactures to ensure that equipment is working properly for reinstallation in spring 2006.

As can be seen in **Table 3**, the QA/QC comparison between the Datasondes and laboratory data was also generally excellent. The laboratory results will become more useful when DOEC begins working on regression analysis in the upcoming year that will allow for predictions of other parameters based on the parameters being measured by the real-time water quality probes.

Overall, the QA/QC measures taken throughout the summer/fall months were very successful in ensuring that the real-time water quality data that is being collected in Voisey's Bay is accurate.

Table 2: QA/QC Results (Datasonde vs. Minisonde)

Station	Reinstallation Date	Parameters	Datasonde Data	Minisonde Data	Rating*
Upper Reid Brook	May 31, 2005	Temp (°C)	2.41	No Minisonde readings were taken	**NA**
		pH (units)	6.07		**NA**
		Conductivity (µS/cm)	7.3		**NA**
		Dissolved Oxygen (mg/L)	12.73		**NA**
	July 21, 2005	Temp (°C)	14.63	14.52	**Excellent**
		pH (units)	6.389	6.72	**Good**
		Conductivity (µS/cm)	9	9.3	**Good**
		Dissolved Oxygen (mg/L)	10.22	10.16	**Excellent**
	September 26, 2005	Temp (°C)	10.04	7.46	**Poor**
		pH (units)	6.559	6.59	**Excellent**
		Conductivity (µS/cm)	7.699	15.7	**Poor**
		Dissolved Oxygen (mg/L)	10.74	10.27	**Good**
Camp Pond Brook	May 31, 2005	Temp (°C)	8.18	No Minisonde readings were taken	**NA**
		pH (units)	7.44		**NA**
		Conductivity (µS/cm)	12.6		**NA**
		Dissolved Oxygen (mg/L)	11.86		**NA**
	July 21, 2005	Temp (°C)	16.53	16.57	**Excellent**
		pH (units)	7.18	6.83	**Good**
		Conductivity (µS/cm)	25.8	25.6	**Excellent**
		Dissolved Oxygen (mg/L)	9.71	8.74	**Marginal**
	September 26, 2005	Temp (°C)	8.43	7.81	**Fair**
		pH (units)	7	6.7	**Good**
		Conductivity (µS/cm)	17.4	19.5	**Fair**
		Dissolved Oxygen (mg/L)	10.92	10.3	**Fair**
Lower Reid Brook	May 31, 2005	Temp (°C)	7.07	No Minisonde readings were taken	**NA**
		pH (units)	7.29		**NA**
		Conductivity (µS/cm)	12		**NA**
		Dissolved Oxygen (mg/L)	12.37		**NA**
	July 21, 2005	Temp (°C)	14.83	14.52	**Good**
		pH (units)	7.28	6.92	**Good**
		Conductivity (µS/cm)	26	25.9	**Excellent**
		Dissolved Oxygen (mg/L)	10.01	9.14	**Marginal**
	September 26, 2005	Temp (°C)	7.7	9.93	**Poor**
		pH (units)	6.66	6.55	**Excellent**
		Conductivity (µS/cm)	17	7.2	**Poor**
		Dissolved Oxygen (mg/L)	10.75	9.44	**Poor**

***** Notes: NA = cannot make comparison

Table 3: QA/QC Results (Datasonde vs. Laboratory)

Station	Reinstallation Date	Parameters	Datasonde Data	Laboratory Data	Rating*
Upper Reid Brook	May 31, 2005	Temp (°C)	2.41		
		pH (units)	6.07	6.46	**Good**
		Conductivity (µS/cm)	7.3	10	**Excellent**
		Dissolved Oxygen (mg/L)	No Datasonde reading		
		Turbidity (NTU)	No Datasonde reading	0.3	**NA**
	July 21, 2005	Temp (°C)	14.63		
		pH (units)	6.389	6.66	**Good**
		Conductivity (µS/cm)	9	11	**Excellent**
		Dissolved Oxygen (mg/L)	10.22		
		Turbidity (NTU)	0	0.7	**Excellent**
	September 26, 2005	Temp (°C)	10.04		
		pH (units)	6.559	6.75	**Excellent**
		Conductivity (µS/cm)	7.699	13	**Good**
		Dissolved Oxygen (mg/L)	10.74		
		Turbidity (NTU)	0	0.4	**Excellent**
Camp Pond Brook	May 31, 2005	Temp (°C)	8.18		
		pH (units)	7.44	6.64	**Fair**
		Conductivity (µS/cm)	12.6	14	**Excellent**
		Dissolved Oxygen (mg/L)	11.86		
		Turbidity (NTU)	2	1.5	**Excellent**
	July 21, 2005	Temp (°C)	16.53		
		pH (units)	7.18	7.19	**Excellent**
		Conductivity (µS/cm)	25.8	28	**Excellent**
		Dissolved Oxygen (mg/L)	9.71		
		Turbidity (NTU)	0	3.1	**Excellent**
	September 26, 2005	Temp (°C)	8.43		
		pH (units)	7	6.93	**Excellent**
		Conductivity (µS/cm)	17.4	30	**Fair**
		Dissolved Oxygen (mg/L)	10.92		
		Turbidity (NTU)	2	0.6	**Excellent**
Lower Reid Brook	May 31, 2005	Temp (°C)	7.07		
		pH (units)	7.29	6.70	**Fair**
		Conductivity (µS/cm)	12	16	**Good**
		Dissolved Oxygen (mg/L)	12.37		
		Turbidity (NTU)	7	1.5	**Good**
	July 21, 2005	Temp (°C)	14.83		
		pH (units)	7.28	7.22	**Excellent**
		Conductivity (µS/cm)	26	29	**Excellent**
		Dissolved Oxygen (mg/L)	10.01		
		Turbidity (NTU)	0	1.2	**Excellent**
	September 26, 2005	Temp (°C)	7.7		
		pH (units)	6.66	7.24	**Fair**
		Conductivity (µS/cm)	17	32	**Fair**
		Dissolved Oxygen (mg/L)	10.75		
		Turbidity (NTU)	0	1.7	**Excellent**

***** Notes: NA = cannot make comparison

Section 5.0 Additional Activities

Quality Assurance /Quality Control Update

The QA/QC procedures were evaluated and updated to incorporate a ranking system. The QA/QC data is ranked excellent, good, fair, marginal and poor for comparative purposes. This ranking is completed for comparison of Datasonde/Minisonde data and Datasonde/Laboratory data. This ranking is done after each removal and installation of the Hydrolabs.

UUUUDetermination of Areas that may Affect Water Quality

DOEC examined the processes that take place at VBNC to determine the areas of the mining process that may have an impact on water quality should an incident occur. The areas identified are as follows:

- Wastewater (untreated) line that goes to Headwater Pond
- Tailings line that goes to Headwater Pond
- Reclaim line that comes from Headwater Pond
- Wastewater Tank inside concentrator building

Schematics of the Voisey's Bay site are available in Appendix A.

Section 6.0 Conclusions

The Voisey's Bay real-time water quality monitoring network has been very successful as a regulatory tool throughout the past year. It has clearly shown that the ambient water quality surrounding the development area is being protected. The near-real time water quality data allows the VNBC staff to act immediately on emerging water quality events.

Upper Reid Brook is a pristine area that can effectively be used as a control station that provides reliable natural background water quality data for comparison purposes. Most importantly, the water quality of both Camp Pond Brook and Lower Reid Brook did not change drastically from the natural background concentrations even though there is a significant amount of development occurring in the watersheds. It is evident that the mitigation measures that have been established by VBNC have significantly reduced the effect of development on the overall water quality. Additionally, the maintenance/calibration techniques and QA/QC procedures are working to ensure that all water quality data is accurate.

In view of a number of spills during this year, DOEC staff will familiarize itself with the mine operation and spill sites. This will better enable DOEC staff to assist in identifying areas which are at risk for water quality incidents.

Section 7.0 Path Forward

In order for a program to be successful, it is essential to continually evaluate and move forward. The following is a list of planned activities to be carried out in the upcoming year. The list also includes some multi-year activities planned in the previous year that are still in progress.

- shipment of instruments for servicing work during the winter months
- testing/preparation of instruments in St. John's office prior to spring deployment to ensure all instruments are functioning properly
- spring site visitation to install all instruments and make changes to data logger programming
- continued monitoring of water quality from late spring to late fall 2006 with continued data analysis in the form of monthly reports
- continued direct communication between DOEC and VBNC staff to respond to emerging issues on a proactive basis
- continued site visitation and training by DOEC staff throughout the summer and fall
- training of new VBNC staff as needed on real-time water quality monitoring
- review and evaluation of site selection/deployment techniques to ensure the most meaningful data is being collected
- continued work on data management/retrieval/archival procedures
- continued transfer of data from DOEC to VBNC staff
- development of a system whereby VBNC staff has access to the real-time water quality data through the web page
- provide on-line statistical analysis of data
- evaluation and upgrading of QA/QC procedures
- work on extrapolation of other water quality parameters using regression analysis
- conversion of stage graphs to flow graphs on the web page
- installation of real time groundwater observation Quanta-G in the tailings dam area
- upgrade Lower Reid Brook Tributary station to real time water quality station
- in view of a number of spills during this year, DOEC staff will familiarize itself with the mine operation and spill sites.
- creation of value added products using the real-time water quality data, remote sensing and water quality indices

Appendix A