

General

- Department of Environment and Conservation staff monitors the real-time web pages consistently.
- Vale Inco will be informed of any significant water quality events in the form of a monthly deployment report and automated alerts as they occur.
- This monthly deployment report interprets the data from Rattling Brook Big Pond, Rattling Brook below Bridge and Rattling Brook below Plant Discharge stations for the period of October, 2009 to November 17, 2009.
- As a result of pond dewatering upstream, work on river crossings and severe precipitation, Rattling Brook has experienced higher-than-normal turbidity conditions during this deployment period. Control measures have been put in place; however, due to rainfall volume these measures have frequently been overcome.

Maintenance and Calibration of Instrument

- As part of the removal and reinstallation process, parameters are recorded from both the field sonde (in situ) and a similar, newly-calibrated QA sonde (placed side by side). The parameters from both instruments are compared and their variability is ranked as part of the QA/QC protocol (see Table 1).
- Upon installation of Datasonde 5X s/n 44604 on August 11th, 2009 all parameters were ranked as “Excellent” except Temperature and pH which were ranked as “Good”. During the removal on September 9th, 2009 Temperature and Conductivity ranked as “Good”. pH, Dissolved Oxygen and Turbidity ranked as “Excellent”.

Table 1: QA/QC Data Comparison Rankings upon Deployment in October and Removal on November 17, 2009.

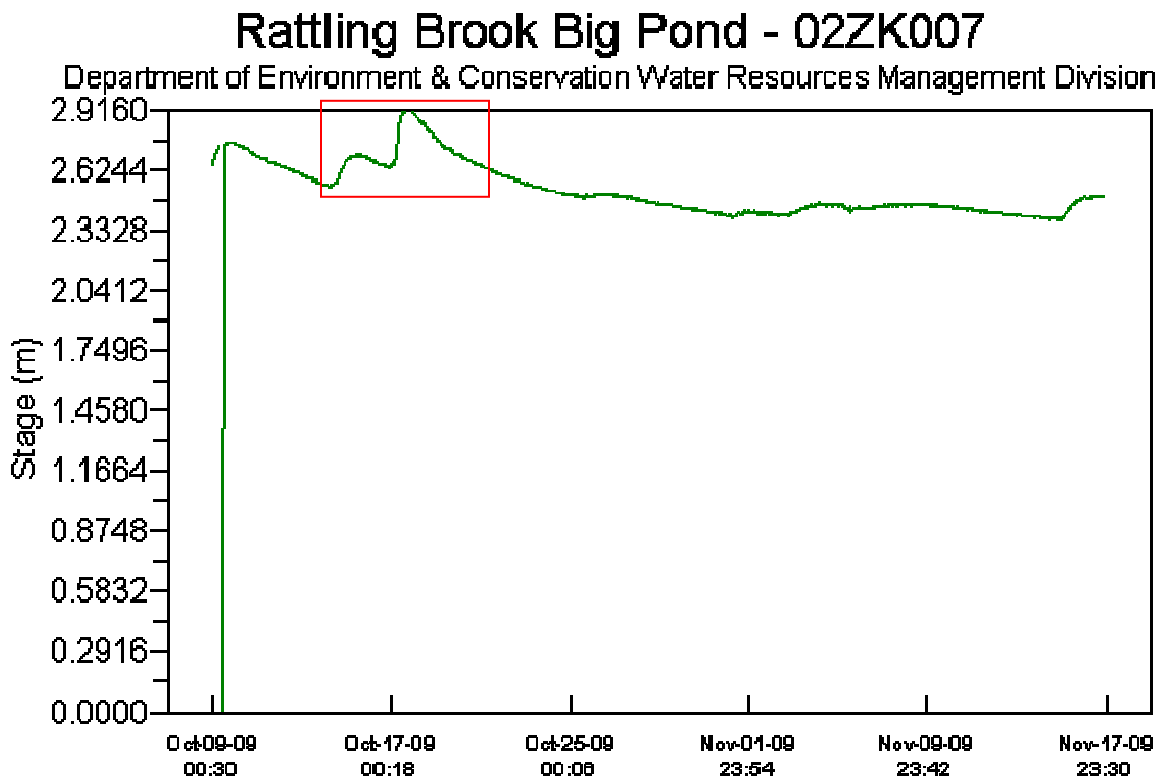
Station	Date	Action	Instrument Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Big Pond	October 9	Installation	Excellent	Excellent	Excellent	Good	Excellent
	November 17	Removal	Excellent	Fair	Excellent	Excellent	Excellent
Below Bridge	October 16	Deployment	Good	Good	Excellent	Good	Good
	November 17	Removal	Good	Good	Good	Good	Excellent
Below Plant Discharge	October 8	Installation	Excellent	Excellent	Excellent	Good	Excellent
	November 17	Removal	Excellent	Good	Excellent	Excellent	Good

Data Interpretation

- The following sections provide details regarding the deployment intervals at Rattling Brook Big Pond (Big Pond), Rattling Brook below Bridge (Below Bridge) and Rattling Brook below Plant Discharge (Plant Discharge).

RATTLING BROOK BIG POND

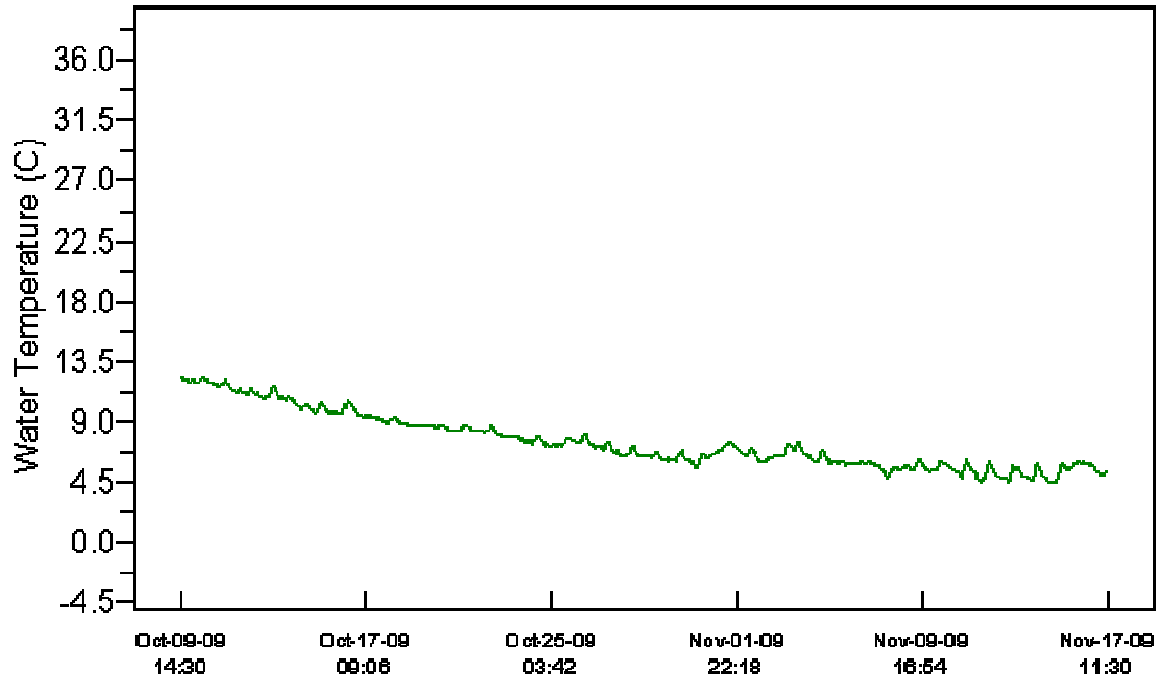
- This is the initial deployment report for Rattling Brook Big Pond station. Prior to installation on October 9, this station was water level only.
- Heavy rain on October 14th, 16th and 17th dropped 27.9, 23.1 and 16.4mm of precipitation in the Rattling Brook area, respectively (according to weather data recorded at Argentia). This precipitation resulted in the indicated peaks in stage level. During the deployment, stage level ranged from 2.902 to 2.368m.



- A steady decline in temperature from October 9th to November 17th is observed at Rattling Brook Big Pond. The deployment maximum temperature was 12.26C with the lowest temperature recorded at 4.44C.

Rattling Brook Big Pond - 02ZK007

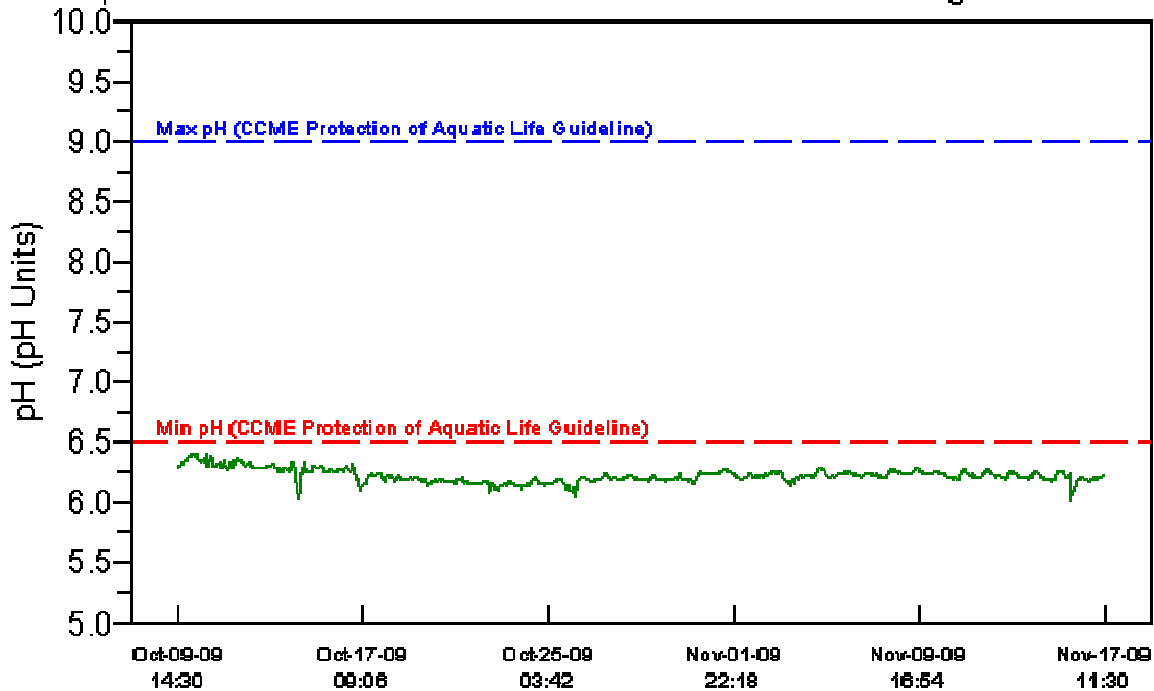
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- pH at Rattling Brook Big Pond was found to be consistently below the CCME guidelines for the Protection of Aquatic Life, however, it is believed that this is the normal, steady-state condition for pH in this system. pH ranged from 6.41 to 6.02 over the deployment period.

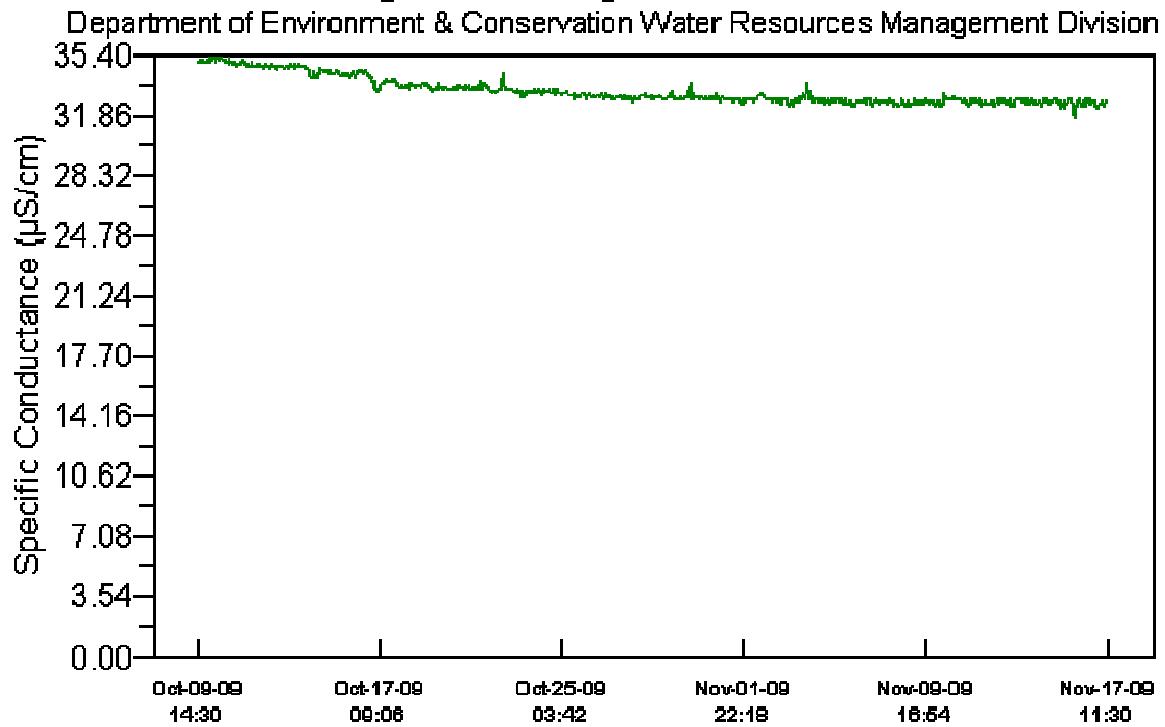
Rattling Brook Big Pond - 02ZK007

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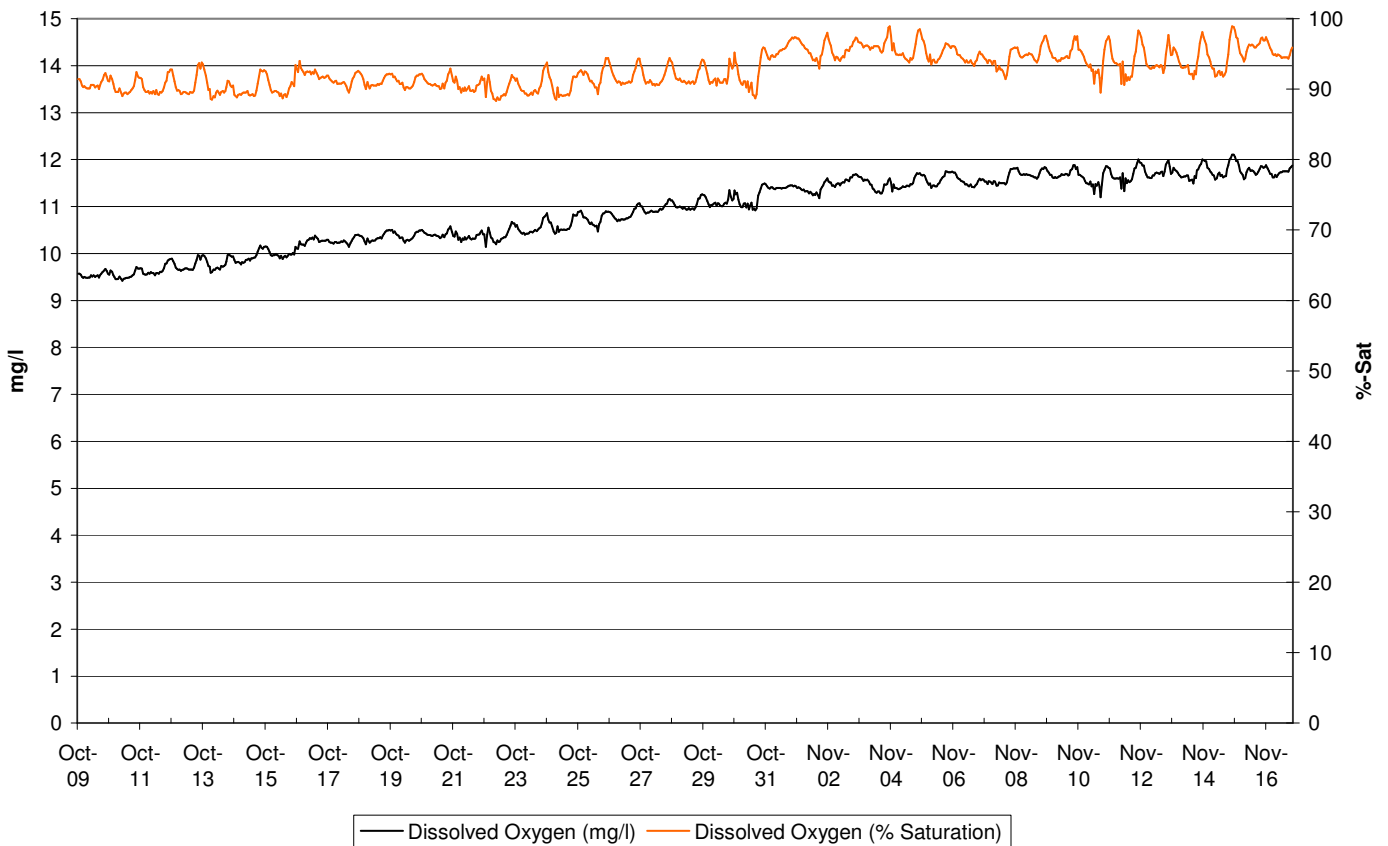
- An asymptotic plot is recorded in Specific Conductance at Big Pond from October 9 to November 17. Conductivity ranged from 35.4 to 31.7 μ S/cm over the deployment as high precipitation in mid-October flushed Big Pond with runoff. A steady decline is observed as the influx of runoff from the rain events tailed off.

Rattling Brook Big Pond - 02ZK007



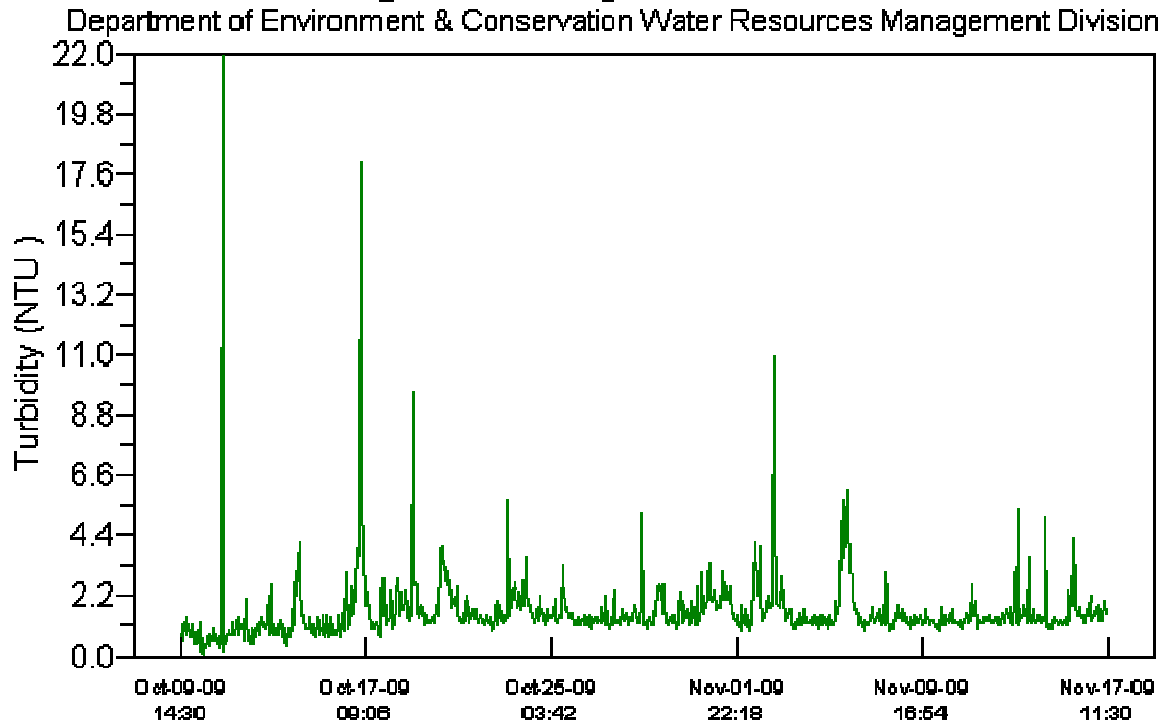
- The concentration of dissolved oxygen increased during the deployment period as water temperature cooled. Percent saturation was stable over the long term with short term fluctuations due to the diurnal cycle. DO concentration ranged from 12.1 to 9.42mg/l and %-Sat ranged from 98.9 to 88.3%.

Rattling Brook Big Pond - NF02ZK0024
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- Due to the close proximity to the shoreline and wave action, the recorded turbidity at Big Pond may not accurately represent average pond-wide conditions. Though the graph indicates an average of 1.6NTU, it is important to note that there are no apparent negative or positive trends in water clarity. A change in placement of the Hydrolab may be warranted in an attempt to avoid unnaturally elevated turbidity readings.

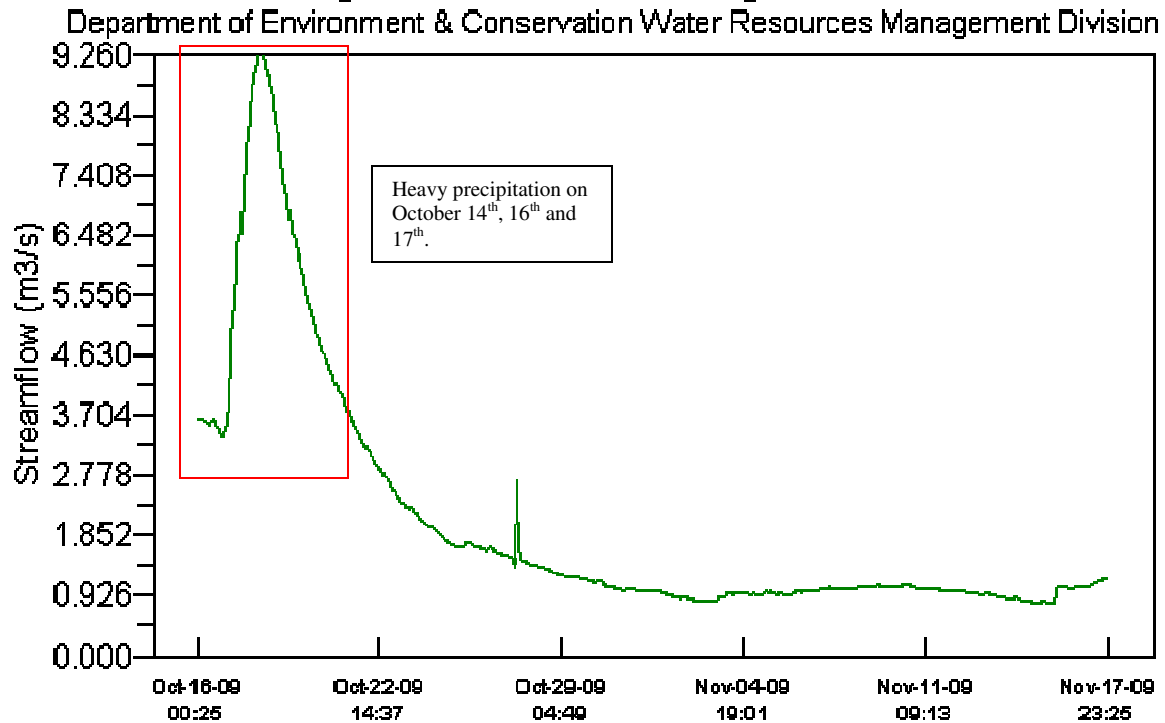
Rattling Brook Big Pond - 02ZK007



RATTLING BROOK BELOW BRIDGE

- The deployment period for Rattling Brook below Bridge began approximately a week following the deployment of the Big Pond and below Plant Discharge Stations. As a result, the rainfall on October 14th, 16th and 17th manifests itself at the beginning of the below Bridge graphs.
- Streamflow peaked at Rattling Brook below Bridge on October 18th at 9.26m³/s and was at its low point on November 15th at 0.804m³/s.

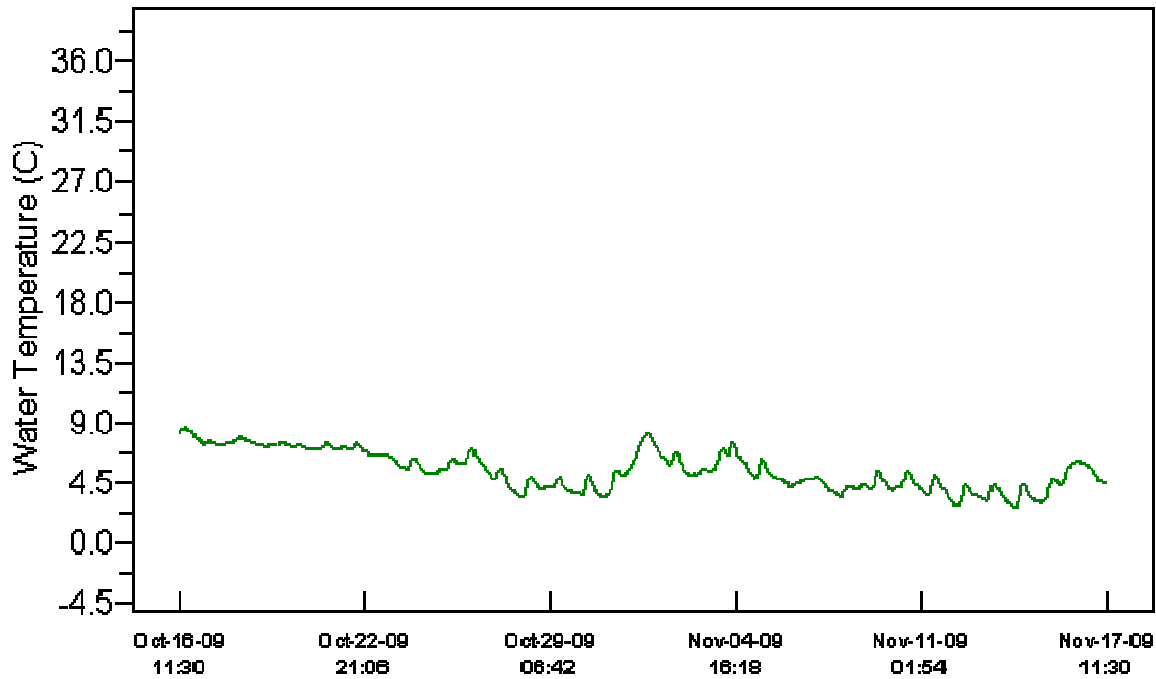
Rattling Brook below Bridge - 02ZK006



- No significant events were noted in water temperature at the below Bridge station during this deployment period. Of note is the depression of normal diurnal temperature cycles during the heavy flow period from October 16th to October 23rd.

Rattling Brook below Bridge - NF02ZK0023

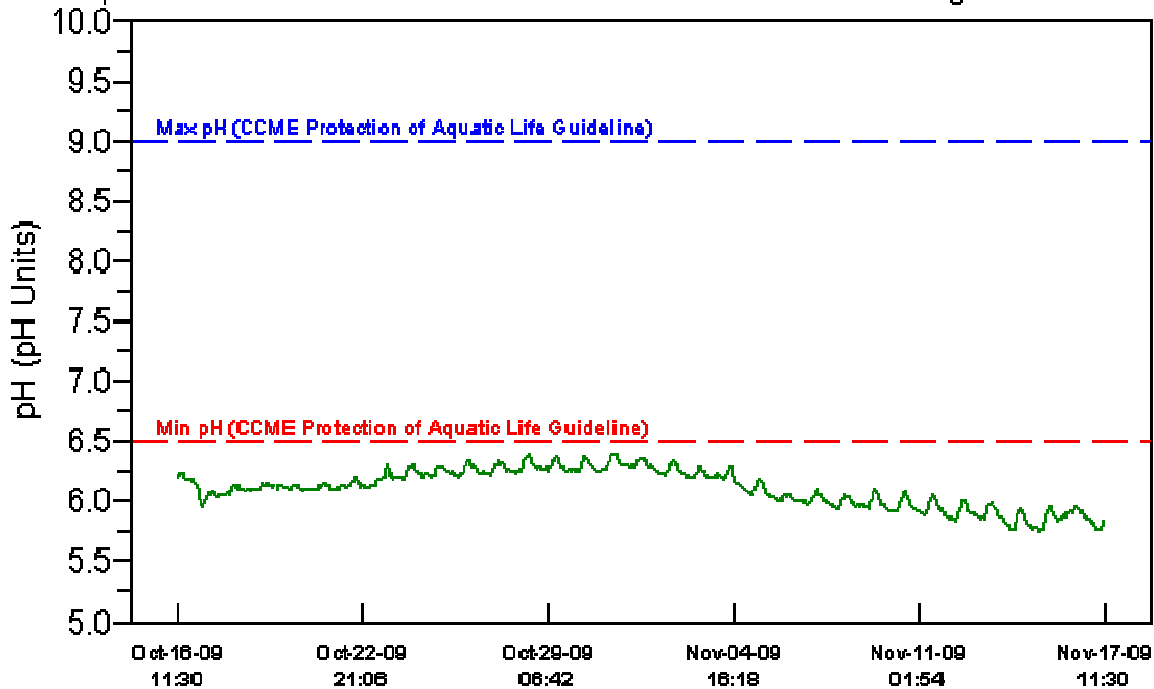
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- pH at the blow Bridge station was consistently below the CCME guidelines for the Protection of Aquatic Life during the deployment period; however, this is typical of Rattling Brook. A decline in pH at the end of the deployment period suggests that drift may have occurred with the pH sensor. pH ranged from 6.38 to 5.76.

Rattling Brook below Bridge - NF02ZK0023

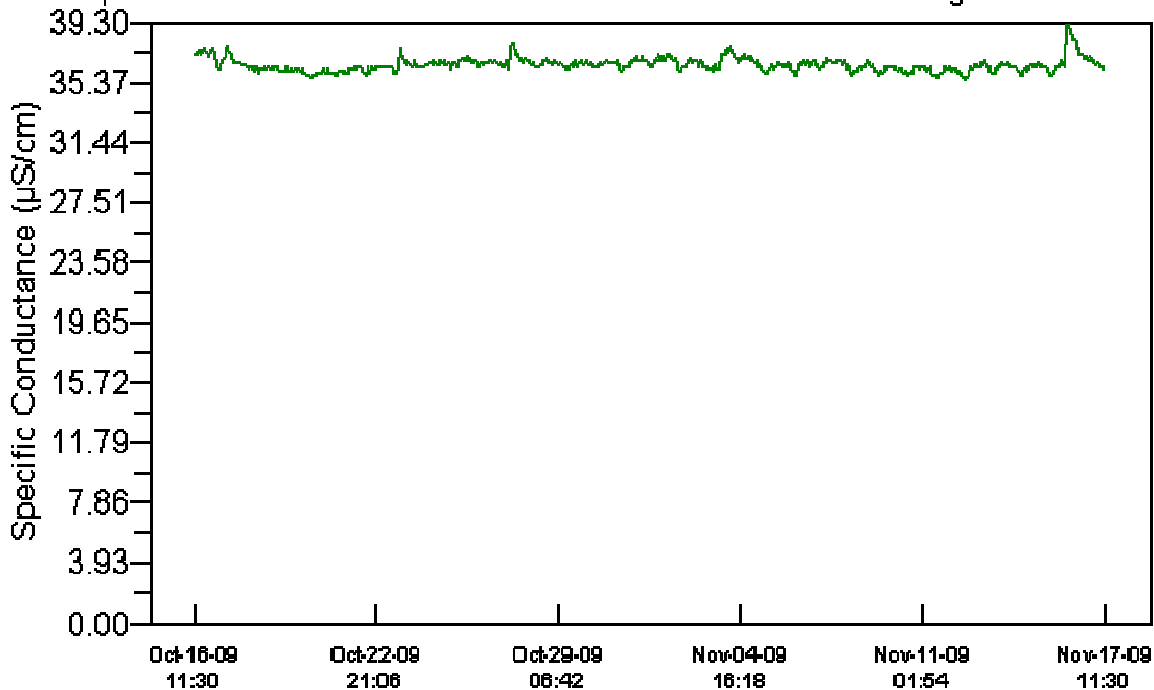
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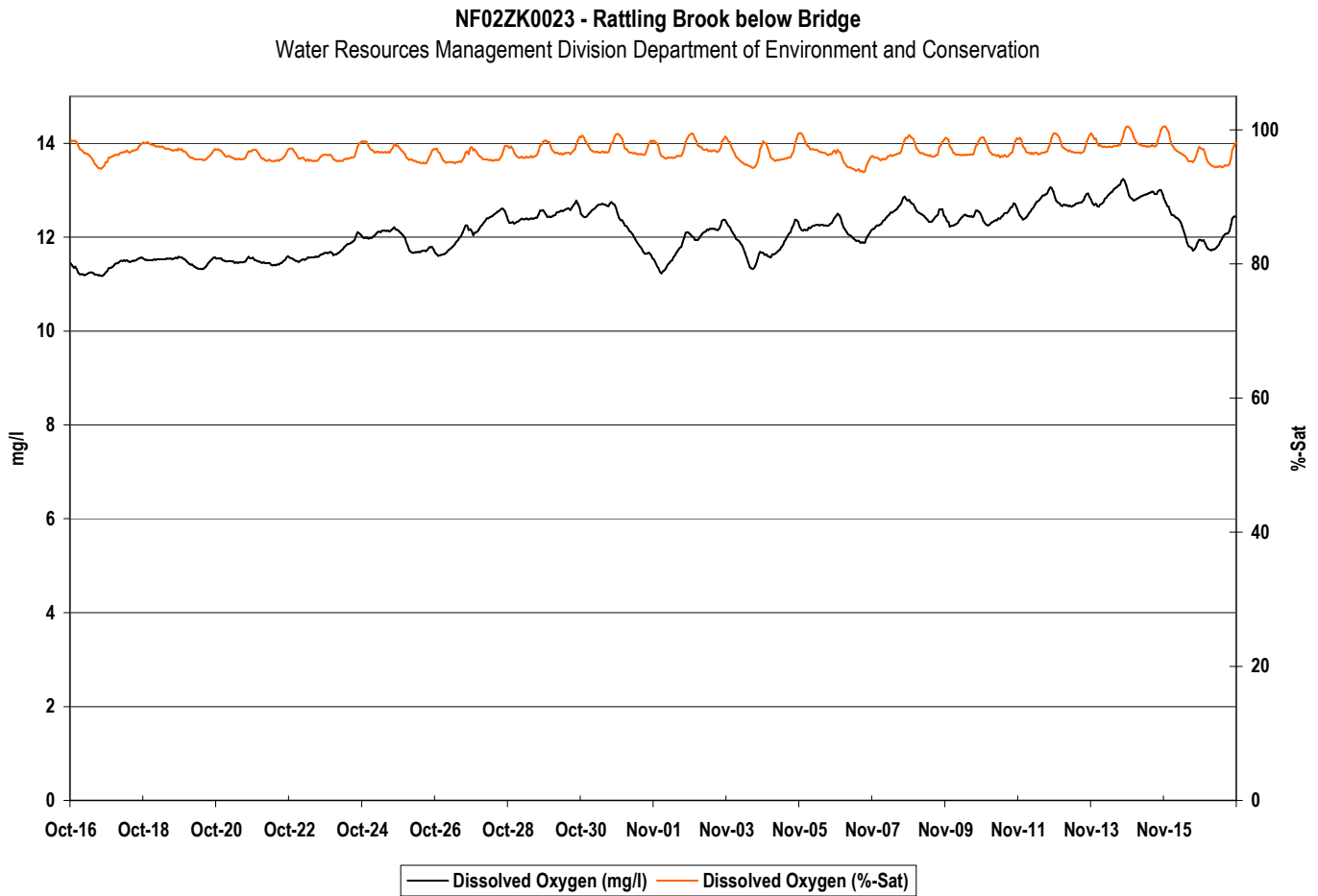
- Specific Conductivity was stable from October 16th to November 17th. Conductivity ranged from 39.3 to 35.6 $\mu\text{S}/\text{cm}$.

Rattling Brook below Bridge - NF02ZK0023

Department of Environment & Conservation Water Resources Management Division

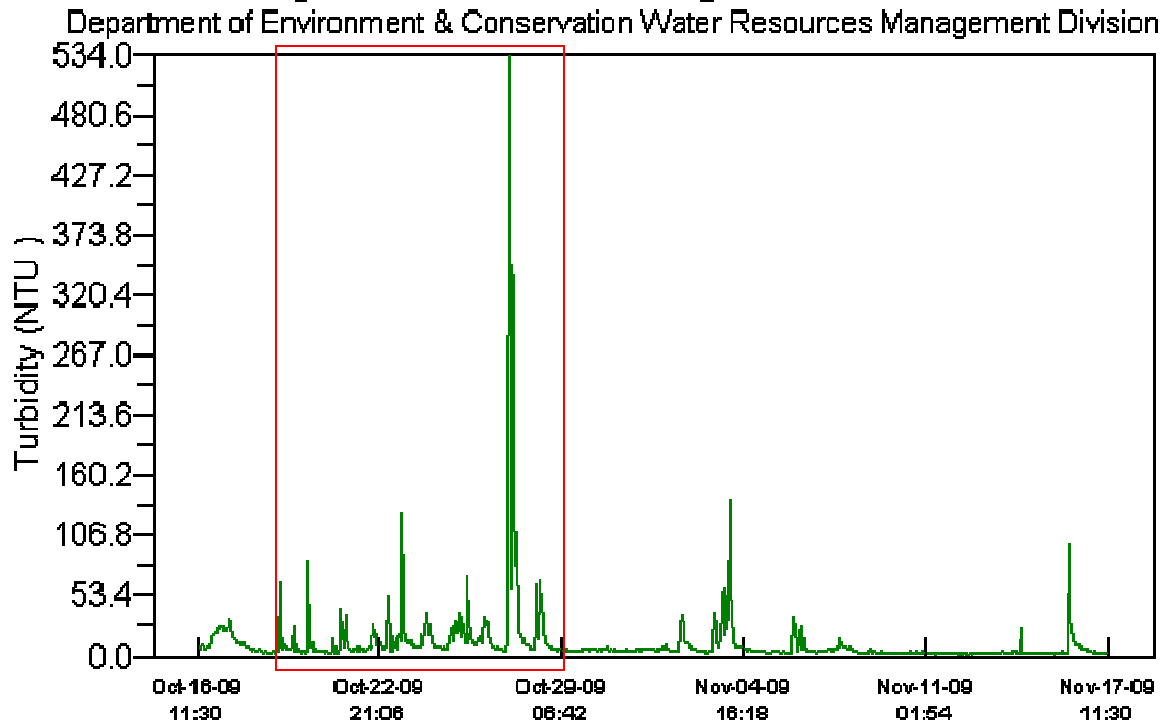


- Dissolved Oxygen concentration increased over the deployment reaching a maximum of 13.24mg/l and a low of 11.18mg/l. At all times, the CCME Guideline of 9.5mg/l for Dissolved Percent was met. Saturation was stable near 100%.

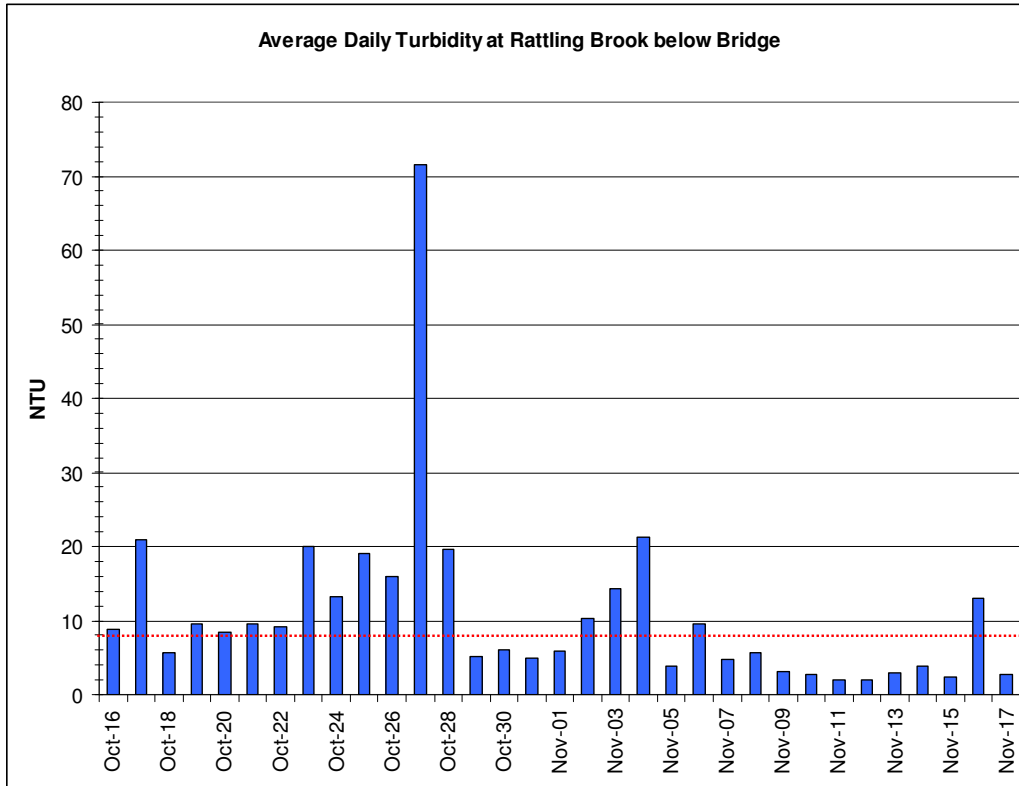


- Turbidity at Rattling Brook below Bridge was highly variable during the deployment period of October 16th to November 17th. Turbidity averaged 56.47 NTU over the deployment. During the same time interval in 2008, the average turbidity was 0.02 NTU with only two readings over zero for the period.

Rattling Brook below Bridge - NF02ZK0023



- According to CCME Guidelines for the Protection of Aquatic Life, turbidity derived from anthropogenic sources shall not impose a change of 8 NTU over baseline in the short term. Also, mean turbidity shall not exceed a change of 2 NTU above baseline in the long term.
 - During this deployment, 17 of 33 days were found to be in excess of the CCME turbidity guideline as indicated by the figure below.

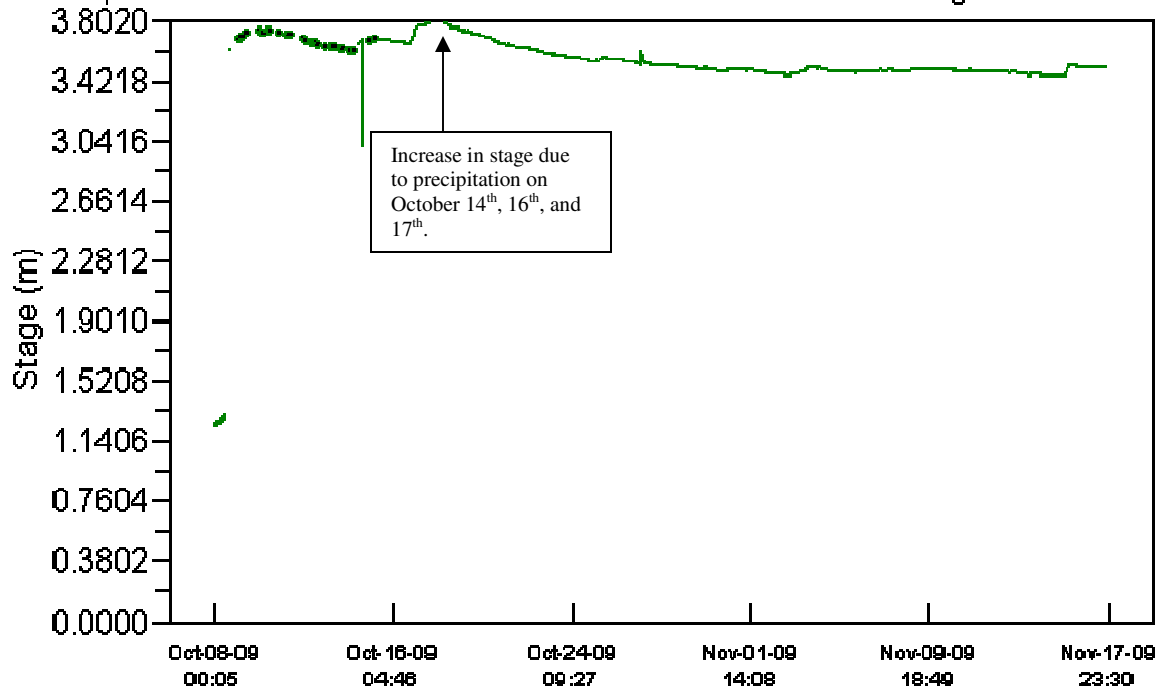


RATTLING BROOK BELOW PLANT DISCHARGE

- This is the initial deployment report for Rattling Brook below Plant Discharge. This station was installed on October 8, 2009 with the intention of intercepting stormwater runoff from the area surrounding the proposed nickel refining plant.
- The first transmissions after installation of this station were spotty with several instances of connectivity loss. This issue was overcome by October 16th when transmission problems were resolved.
- Stage at below plant discharge peaked at 3.8m following rain in mid-October and trailed off for the rest of the deployment interval.

Rattling Brook below Plant Discharge - 02ZK008

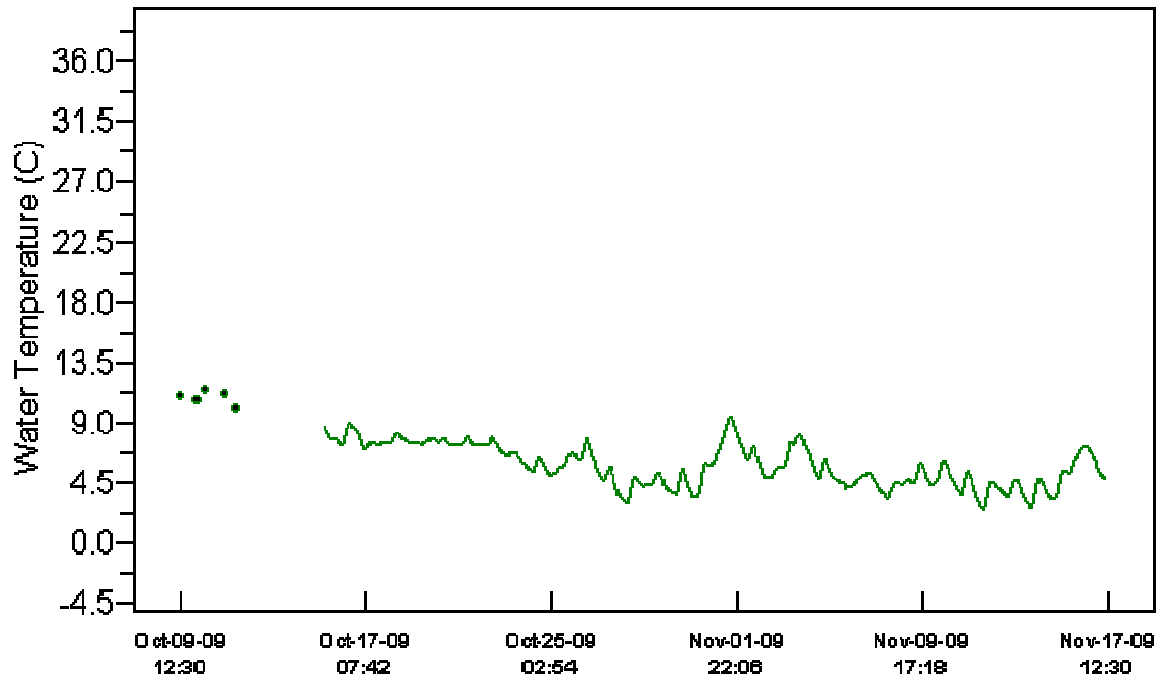
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- Cloud cover and precipitation effects moderated the daily cycle of water temperature at the below Plant Discharge station. In late October, the daily saw tooth pattern becomes obvious once again as the weather clears.

Rattling Brook below Plant Discharge - NF02ZK0025

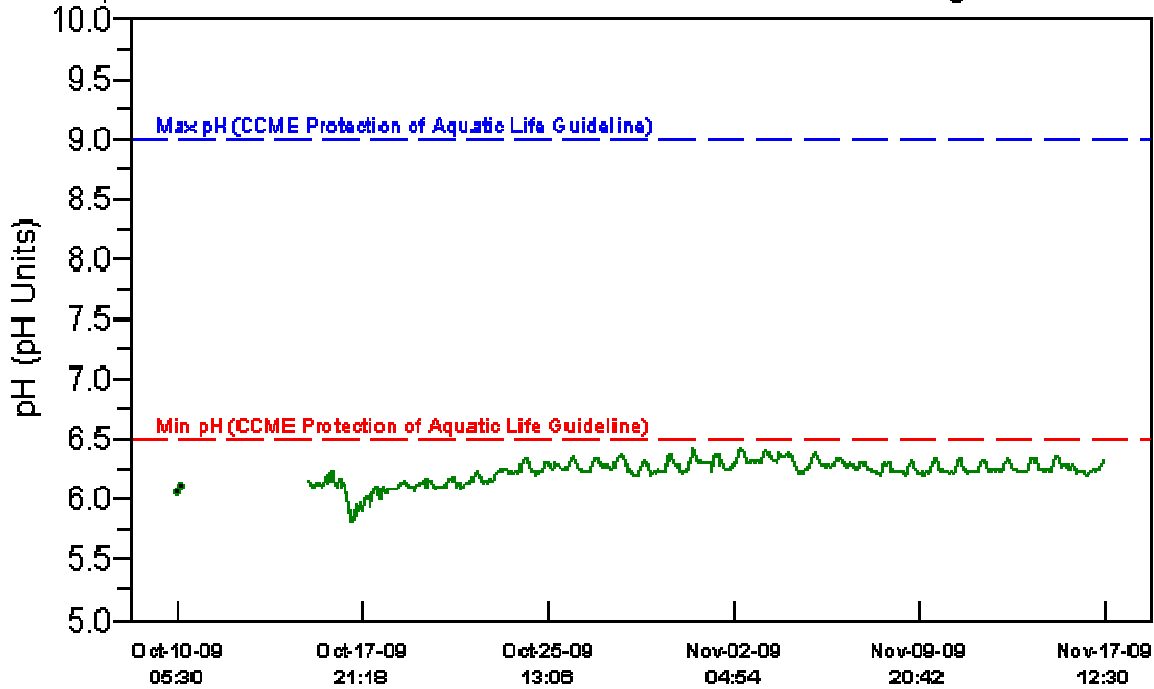
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- pH at Rattling Brook below Plant Discharge was consistently below the CCME Guideline for the Protection of Aquatic life, falling below 6.5 for the entire deployment. This is likely the norm for Rattling Brook given the geology and acidity of natural waters in the region. A sharp decline in pH on October 16th is due to precipitation.

Rattling Brook below Plant Discharge - NF02ZK0025

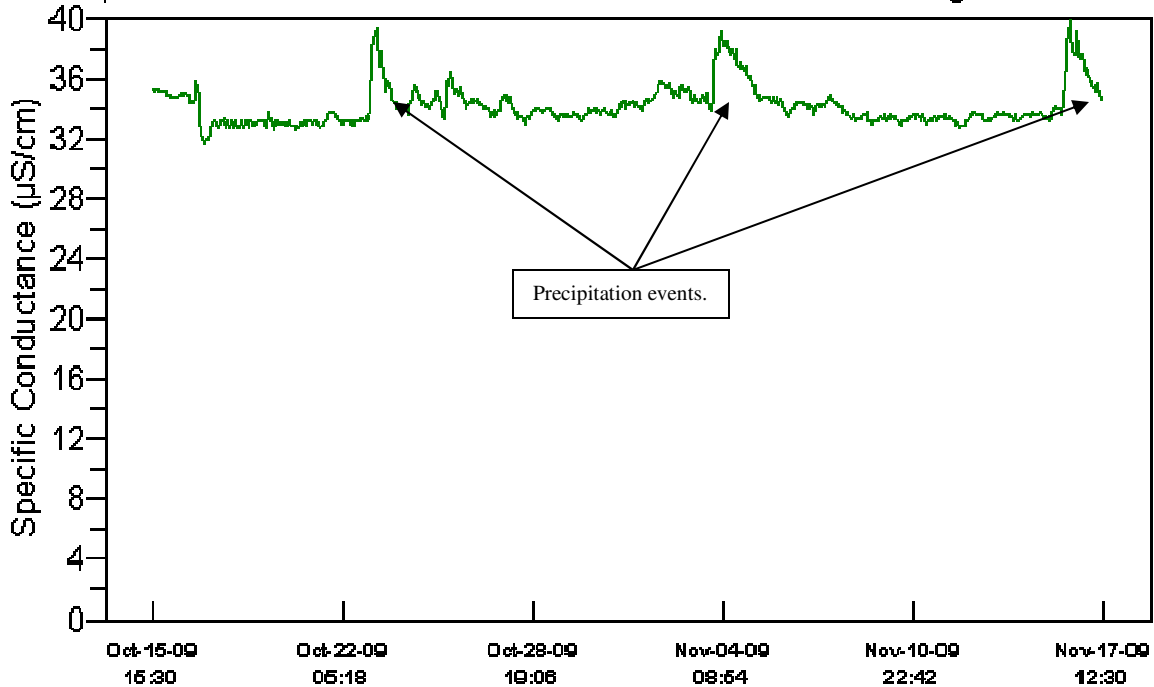
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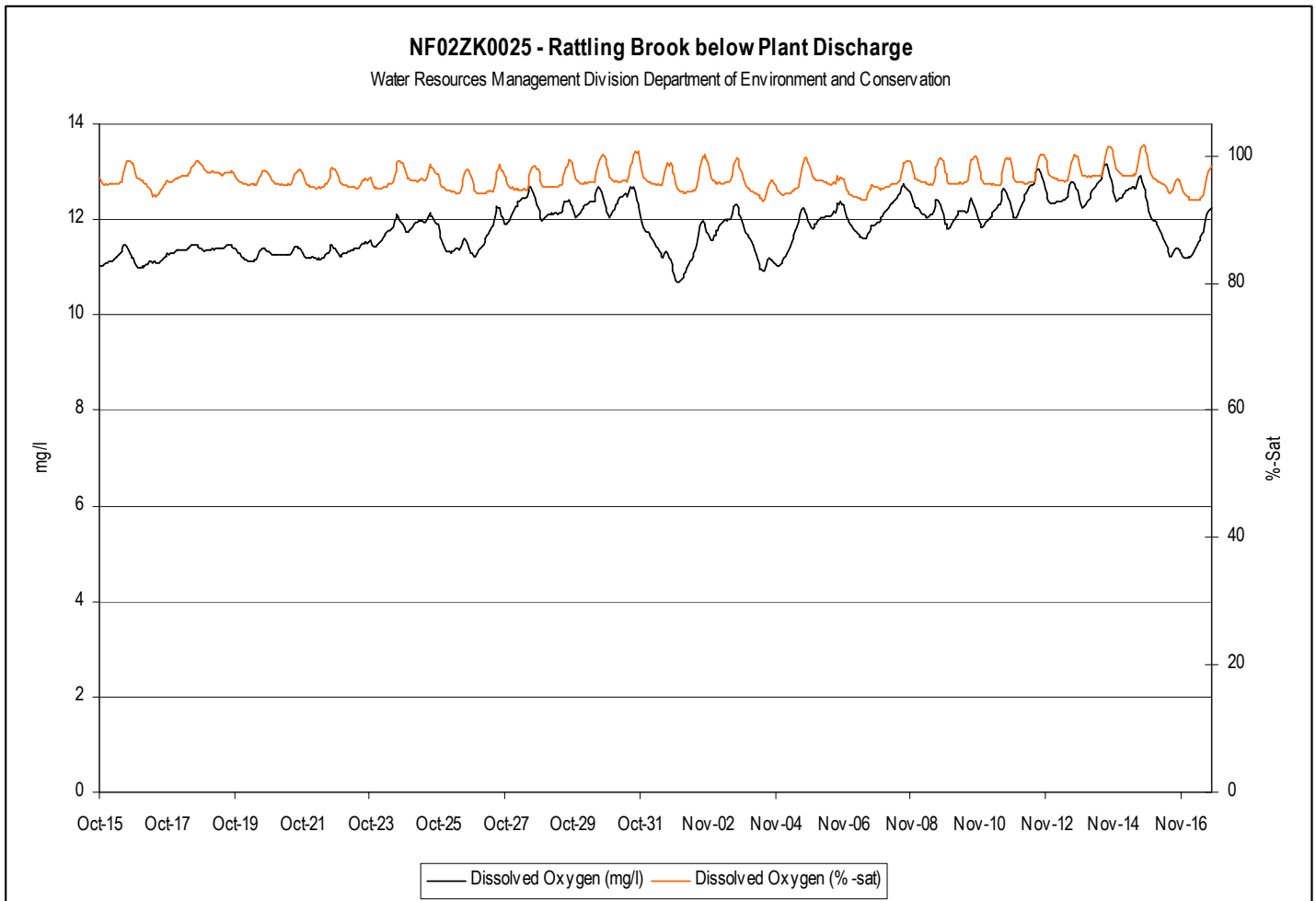
- Heavy stream and overland flow from precipitation results in spiking specific conductivity

Rattling Brook below Plant Discharge - NF02ZK0025

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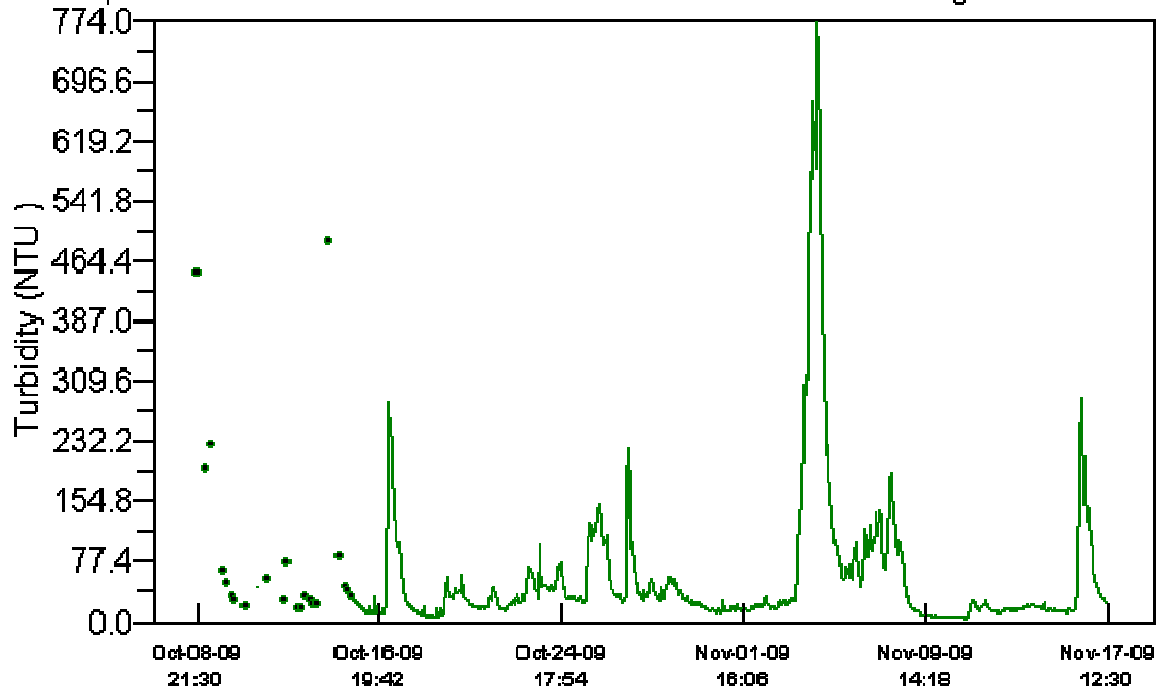
- With a steady decline in water temperature, the dissolved oxygen content of Rattling Brook has also increased and remained above the 9.5 mg/l CCME guideline for the Protection of Aquatic Life. Saturation remained level during the deployment interval



- Turbidity at Rattling Brook below Plant Discharge was recorded with multiple large peaks and an average of 56.47 NTU. A rainfall of 13.3 mm occurred on November 4th during the maximal reading of 774 NTU. A much smaller peak, however, occurred on November 16th following 17.0mm of rain on November 15th and 16th. Attributing peaks in turbidity to precipitation is troublesome and no relationship has been found to date.

Rattling Brook below Plant Discharge - NF02ZK0025

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Appendix

Daily Data Report for October 2009

<u>D</u> <u>a</u> <u>y</u>	<u>Max</u> <u>Temp</u> °C	<u>Min</u> <u>Temp</u> °C	<u>Mean</u> <u>Temp</u> °C	<u>Heat</u> <u>Deg</u> <u>Days</u> °C	<u>Cool</u> <u>Deg</u> <u>Days</u> °C	<u>Total</u> <u>Rain</u> mm	<u>Total</u> <u>Snow</u> cm	<u>Total</u> <u>Precip</u> mm	<u>Snow</u> <u>on</u> <u>Grnd</u> cm	<u>Dir of</u> <u>Max</u> <u>Gust</u> 10's Deg	<u>Spd of</u> <u>Max</u> <u>Gust</u> km/h
<u>01</u> †	21.3	14.3	17.8	0.2	0.0	M	M	5.4		15	37
<u>02</u> †	17.4	11.1	14.3	3.7	0.0	M	M	35.9		25	37
<u>03</u> †	12.7	8.8	10.8	7.2	0.0	M	M	0.0		27	61
<u>04</u> †	11.8	5.8	8.8	9.2	0.0	M	M	0.0		35	46
<u>05</u> †	11.4	5.9	8.7	9.3	0.0	M	M	2.6		12	83
<u>06</u> †	12.8	10.3	11.6	6.4	0.0	M	M	1.9		21	37
<u>07</u> †	12.2	8.2	10.2	7.8	0.0	M	M	0.6		27	57
<u>08</u> †	9.2	7.9	8.6	9.4	0.0	M	M	25.3		36	72
<u>09</u> †	10.0	7.0	8.5	9.5	0.0	M	M	2.0		36	72
<u>10</u> †	9.5	6.6	8.1	9.9	0.0	M	M	0.7		36	44
<u>11</u> †	10.7	6.7	8.7	9.3	0.0	M	M	6.6		29	67
<u>12</u> †	8.8	5.6	7.2	10.8	0.0	M	M	0.6		27	65
<u>13</u> †	9.8	4.4	7.1	10.9	0.0	M	M	0.9		23	50
<u>14</u> †	5.9	1.5	3.7	14.3	0.0	M	M	27.9		36	104
<u>15</u> †	8.5	5.1	6.8	11.2	0.0	M	M	0.0		29	57
<u>16</u> †	8.1	1.6	4.9	13.1	0.0	M	M	23.1		10	74
<u>17</u> †	7.0	2.8	4.9	13.1	0.0	M	M	16.4		10	120
<u>18</u> †	6.1	1.7	3.9	14.1	0.0	M	M	0.0		9	37
<u>19</u> †	9.3	1.5	5.4	12.6	0.0	M	M	9.4		12	56
<u>20</u> †	7.3	3.3	5.3	12.7	0.0	M	M	0.6		4	46
<u>21</u> †	5.9	3.0	4.5	13.5	0.0	M	M	0.6			<31
<u>22</u> †	7.3	2.4	4.9	13.1	0.0	M	M	0.6		33	39
<u>23</u> †	4.0	1.7	2.9	15.1	0.0	M	M	1.4		35	67
<u>24</u> †	4.5	0.2	2.4	15.6	0.0	M	M	0.0		33	61
<u>25</u> †	11.7	0.3	6.0	12.0	0.0	M	M	6.9		20	89
<u>26</u> †	8.4	2.6	5.5	12.5	0.0	M	M	0.0		32	70
<u>27</u> †	3.2	-0.1	1.6	16.4	0.0	M	M	0.0		32	72
<u>28</u> †	5.1	-0.5	2.3	15.7	0.0	M	M	0.0		32	70
<u>29</u> †	6.4	0.6	3.5	14.5	0.0	M	M	0.0		2	50
<u>30</u> †	5.0	-1.6	1.7	16.3	0.0	M	M	0.0		28	32
<u>31</u> †	8.8	2.3	5.6	12.4	0.0	M	M	0.0		22	69
<u>Sum</u>				351.8	0.0	M	M	169.4			
<u>Avg</u>	9	4.2	6.63								
<u>Xtrm</u>	21.3	-1.6								10	120

Daily Data Report for November 2009

<u>D</u> <u>a</u> <u>y</u>	<u>Max</u> <u>Temp</u> °C	<u>Min</u> <u>Temp</u> °C	<u>Mean</u> <u>Temp</u> °C	<u>Heat</u> <u>Deg</u> <u>Days</u> °C	<u>Cool</u> <u>Deg</u> <u>Days</u> °C	<u>Total</u> <u>Rain</u> mm	<u>Total</u> <u>Snow</u> cm	<u>Total</u> <u>Precip</u> mm	<u>Snow</u> <u>on</u> <u>Grnd</u> cm	<u>Dir of</u> <u>Max</u> <u>Gust</u> 10's Deg	<u>Spd of</u> <u>Max</u> <u>Gust</u> km/h
01†	11.0	6.3	8.7	9.3	0.0	M	M	4.1		21	83
02†	7.0	1.1	4.1	13.9	0.0	M	M	0.0		6	32
03†	15.3	2.2	8.8	9.2	0.0	M	M	13.3		14	74
04†	13.5	4.8	9.2	8.8	0.0	M	M	0.0		27	61
05†	5.6	1.5	3.6	14.4	0.0	M	M	0.0		28	69
06†	7.1	1.7	4.4	13.6	0.0	M	M	1.7		8	76
07†	6.6	-0.1	3.3	14.7	0.0	M	M	3.5		34	70
08†	6.2	-0.6	2.8	15.2	0.0	M	M	3.2		19	57
09†	7.3	4.5	5.9	12.1	0.0	M	M	0.0		26	43
10†	7.3	0.9	4.1	13.9	0.0	M	M	0.0		24	33
11†	6.7	-1.7	2.5	15.5	0.0	M	M	1.5		34	59
12†	5.3	-1.2	2.1	15.9	0.0	M	M	0.0		25	44
13†	7.2	0.6	3.9	14.1	0.0	M	M	0.0		29	46
14†	6.2	0.1	3.2	14.8	0.0	M	M	0.0		23	41
15†	12.2	3.9	8.1	9.9	0.0	M	M	14.1		20	80
16†	9.4	4.8	7.1	10.9	0.0	M	M	2.9		22	65
17†	5.2	0.6	2.9	15.1	0.0	M	M	0.0		27	67
18†	5.2	-0.6	2.3	15.7	0.0	M	M	0.0		25	54
19†	5.0	-2.2	1.4	16.6	0.0	M	M	0.0		33	50
20†	5.6	-1.5	2.1	15.9	0.0	M	M	0.0		23	46
21†	12.1	4.7	8.4	9.6	0.0	M	M	2.6		21	80
22†	5.3	-1.3	2.0	16.0	0.0	M	M	0.0		34	44
23†	4.4	-2.1	1.2	16.8	0.0	M	M	0.0		27	52
24†	5.1	3.0	4.1	13.9	0.0	M	M	0.0		26	48
25†	6.2	3.4	4.8	13.2	0.0	M	M	0.0		27	35
26†	13.4	6.0	9.7	8.3	0.0	M	M	15.4		20	72
27†	15.5	5.7	10.6	7.4	0.0	M	M	26.5		17	70
28†	15.5	9.9	12.7	5.3	0.0	M	M	3.4		18	70
29†	10.8	1.9	6.4	11.6	0.0	M	M	1.3		25	82
30†	10.2	2.9	6.6	11.4	0.0	M	M	2.2		27	85
Sum				383.0	0.0	M	M	95.7			
Avg	8.4	2	5.21								
Xtrm	15.5	-2.2								27	85

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