

# Real Time Water Quality Report Humber River at Humber Village

Deployment Period 2012-02-15 to 2012-05-03

2012-05-09



Government of Newfoundland & Labrador Department of Environment and Conservation Water Resources Management Division

# General

- This station is operated as part of the Provincial Real Time Water Quality (RTWQ) network.
- This station is operated year round.
- Staff of the Water Resources Management Division (WRMD) monitors the real-time web page on a daily basis. Any unusual observations are investigated.
- This site is easily accessed and the instrument is normally removed on a monthly to bi-monthly basis for maintenance and calibration and is reinstalled within one to two days.

## Maintenance and Calibration of Instrumentation

• After being freshly calibrated the **DataSonde**<sup>®</sup> for Humber River at Humber Village was installed on February 15, 2012, and remained deployed continuously until May 3, 2012. This deployment period was a total of 78 days and the instrument maintained good operation for the duration of the deployment.

# Quality Assurance / Quality Control (QA/QC) Measures

• As part of the Quality Assurance and Quality Control (QA/QC) protocol, an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey.

|                                     | Rank      |                |                |              |        |
|-------------------------------------|-----------|----------------|----------------|--------------|--------|
| Parameter                           | Excellent | Good           | Fair           | Marginal     | Poor   |
| Temperature (oC)                    | <=+/-0.2  | >+/-0.2 to 0.5 | >+/-0.5 to 0.8 | >+/-0.8 to 1 | <+/-1  |
| pH (unit)                           | <=+/-0.2  | >+/-0.2 to 0.5 | >+/-0.5 to 0.8 | >+/-0.8 to 1 | >+/-1  |
| Sp. Conductance (µS/cm)             | <=+/-3    | >+/-3 to 10    | >+/-10 to 15   | >+/-15 to 20 | >+/-20 |
| Sp. Conductance > $35 \mu$ S/cm (%) | <=+/-3    | >+/-3 to 10    | >+/-10 to 15   | >+/-15 to 20 | >+/-20 |
| Dissolved Oxygen (mg/L) (% Sat)     | <=+/-0.3  | >+/-0.3 to 0.5 | >+/-0.5 to 0.8 | >+/-0.8 to 1 | >+/-1  |
| Turbidity <40 NTU (NTU)             | <=+/-2    | >+/-2 to 5     | >+/-5 to 8     | >+/-8 to 10  | >+/-10 |
| Turbidity > 40 NTU (%)              | <=+/-5    | >+/-5 to 10    | >+/-10 to 15   | >+/-15 to 20 | >+/-20 |



- Upon deployment, a QA/QC DataSonde<sup>®</sup> is temporarily deployed *in situ*, adjacent to the Field DataSonde<sup>®</sup>. Depending on the degree of difference between each parameter from the Field and QA/QC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
- At the end of a deployment period, a freshly cleaned and calibrated QA/QC sonde is placed *in situ*, adjacent to the Field sonde. Values are compared between all parameters and differences are ranked for placement in Table 2.
- The ranking at the beginning and end of the deployment period are shown in **Table 2**.
- With the exception of water quantity data (Stage), all data used in the preparation of the graphs and subsequent discussion below adhere to this stringent Quality Assurance and Quality Control (QA/QC) protocol. Water Survey of Canada is responsible for QA/QC of water quantity data and corrected data can be obtained upon request.

| Humber River at Humber Village (NF02Y10012) |                          |           |  |  |  |  |  |
|---|--------------------------|-----------|--|--|--|--|--|
| Date<br>(yyyy-mm-dd)                        | Parameter                | Ranking   |  |  |  |  |  |
|   | Temp (°C)                | Excellent |  |  |  |  |  |
| 2012 02 15                                  | pH (units)               | Excellent |  |  |  |  |  |
| 2012-02-13<br>Deployment                    | Sp. Conductivity (uS/cm) | Excellent |  |  |  |  |  |
| Deployment                                  | Dissolved Oxygen (mg/L)  | Fair      |  |  |  |  |  |
|   | Turbidity (NTU)          | Excellent |  |  |  |  |  |
|   | Temp (°C)                | Good      |  |  |  |  |  |
| 2012 05 02                                  | pH (units)               | Excellent |  |  |  |  |  |
| 2012-03-05                                  | Sp. Conductivity (uS/cm) | Good      |  |  |  |  |  |
| Keliloval                                   | Dissolved Oxygen (%)     | Excellent |  |  |  |  |  |
|   | Turbidity (NTU)          | Excellent |  |  |  |  |  |
|   | T.LL 3                   |           |  |  |  |  |  |

#### Table 2

## **Data Interpretation**



#### Water Temperature and Stage Level

- Figure 1
- The water temperature (**Figure 1**) ranged from a minimum of 0.28 °C to a maximum of 3.06 °C, with a very slight increasing trend throughout the deployment period. The average temperature for the deployment period was 1.41°C.

• For most of the deployment period there is a clear diurnal temperature cycling trend visible. This trend is caused by cooling each night and warming during the day. However, it can be noted that around April 18 (see inside red oval) the formerly distinct diurnal trend becomes obscured and much less distinct. This is due to a significant increase in flow from spring runoff. The larger volume of water during this high flow period is not as easily affected by diurnal air temperature trends.



## Water pH and Stage Level

- The pH (Figure 2) ranged from a low of 6.02 to a high of 7.09 and remained relatively stable throughout the deployment period.
- Most pH readings were within the range of 6.5 to 9.0 as recommended by CCME for the Protection of Aquatic Life. While there were some readings below the recommended lower pH 6.5 guideline the average pH was 6.83.



Specific Conductivity of Water and Stage Level

- The specific conductivity (Figure 3) ranged from a minimum of 36.7  $\mu$ S/cm to a maximum of 41.2  $\mu$ S/cm and remained relatively stable over the deployment period. The average specific conductivity for the entire deployment period was 38.4  $\mu$ S/cm.
- Earlier in the deployment period there are a couple of occasions (see inside red ovals) where there is a noticeable increase in specific conductance. In both cases these increases correspond with an increase in flow. From a review of the climate data for the period it appears that the first increase in flow is related to a rainfall/snowfall event and the second period is due to warmer weather and increased snowmelt. During these periods of increased flow additional dissolved material is washed into the river causing an increase in specific conductance.
- During the latter phase of the deployment there appears to be a point at which specific conductance takes a noticeable drop (see inside the blue oval). It appears that this drop is related to the onset of spring runoff when flows are much higher than normal and the level of dissolved material in the water is somewhat diluted.



## **Dissolved Oxygen Concentration and Saturation**

- The dissolved oxygen (Figure 4) values ranged from a minimum of 12.68 mg/L to a maximum of 13.46 mg/L over the deployment period with an average of 12.93 mg/L. The percent saturation for dissolved oxygen ranged from a low of 90.0% to a high of 95.1% with an average of 92.0%.
- During most of the deployment period the dissolved oxygen readings show a distinct diurnal trend which is most notable with the percent saturation readings and is related to the diurnal temperature trend. However, it can be noted that towards the end of the deployment period (see inside the red oval) the diurnal trend is almost completely obscured. This appears to be related to the high flood flow levels caused by spring runoff which significantly dampen the diurnal temperature trend.
- Throughout the deployment period, all dissolved oxygen values fell above the limits recommended by CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Life* for early life stages (above 9.5 mg/L).



Water Turbidity and Stage Level

- Turbidity values ranged from 0.0 NTU to 2.9 NTU with an average of 0.0 NTU.
- There are two small spikes in turbidity during the deployment which most likely can be attributed to temporary interference from debris accumulation around the sensor. The turbidity at this site is usually close to zero but interference from biofouling or debris can cause false readings. A real turbidity event involving siltation or some other mechanism would usually show turbidity levels building up and attenuating over a period of hours or even days, rather than a single short-lived turbidity reading.



- The stage height (Figure 6) or water level ranged from a minimum of 1.66 m to a maximum of 4.07 m with the corresponding flow ranging from 168 m<sup>3</sup>/s to 640 m<sup>3</sup>/s.
- From mid-April onwards the stage height and flow show a significant increase with peak flow around April 30. This flood event is related to normal spring runoff with significantly increased flow due to rainfall and snowmelt.

## **Climate Data**

 Climate data for most of the deployment period from the nearest station (Corner Brook) is included in Appendix A. It should be noted that the climate data for the last two weeks of the deployment period were not available at the time this report was prepared.

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|             |                   |                   |                    | Da                         | lly Data R                 | ерогс гог                         | February                          | y 2012                              |                       |                       |                            |
|-------------|-------------------|-------------------|--------------------|----------------------------|----------------------------|-----------------------------------|-----------------------------------|-------------------------------------|-----------------------|-----------------------|----------------------------|
| D<br>a<br>v | Max<br>Temp<br>°C | Min<br>Temp<br>°C | Mean<br>Temp<br>°C | <u>Heat</u><br>Deg<br>Days | <u>Cool</u><br>Deg<br>Days | <u>Total</u><br><u>Rain</u><br>mm | <u>Total</u><br><u>Snow</u><br>cm | <u>Total</u><br><u>Precip</u><br>mm | Snow on<br>Grnd<br>cm | Dir of<br>Max<br>Gust | Spd of<br>Max Gust<br>km/h |
| 7           | ~                 | ~                 | ~                  | ~                          | ~                          | ~                                 | ~                                 | ~                                   | ~                     | 10's deg              | ~                          |
| <u>15</u> † | 2.0               | -11.5             | -4.8               | 22.8                       | 0.0                        | 0.4                               | 0.0                               | 0.4                                 | 40                    |                       |                            |
| <u>16</u> † | 2.0               | -1.0              | 0.5                | 17.5                       | 0.0                        | 0.2                               | 0.0                               | 0.2                                 | 38                    |                       |                            |
| <u>17</u> + | 1.0               | -1.0              | 0.0                | 18.0                       | 0.0                        | 0.0                               | 0.0                               | 0.0                                 | 38                    |                       |                            |
| <u>18</u> † | 2.0               | -2.5              | -0.3               | 18.3                       | 0.0                        | 0.0                               | 12.4                              | 12.4                                | 35                    |                       |                            |
| <u>19</u> † | -0.5              | -2.0              | -1.3               | 19.3                       | 0.0                        | 0.0                               | 5.6                               | 5.6                                 | 47                    |                       |                            |
| <u>20</u> + | -3.0              | -4.5              | -3.8               | 21.8                       | 0.0                        | 0.0                               | 0.0                               | 0.0                                 | 51                    |                       |                            |
| <u>22</u> † | 1.0               | -7.5              | -3.3               | 21.3                       | 0.0                        | 0.0                               | 1.4                               | 1.4                                 | 48                    |                       |                            |
| <u>23</u> † | 6.5               | -3.0              | 1.8                | 16.2                       | 0.0                        | 0.0                               | 3.6                               | 3.6                                 | 47                    |                       |                            |
| <u>24</u> † | 1.5               | -1.0              | 0.3                | 17.7                       | 0.0                        | 0.0                               | 0.0                               | 0.0                                 | 0                     |                       |                            |
| <u>25</u> † | 2.5               | -3.0              | -0.3               | 18.3                       | 0.0                        | 0.2                               | 9.6                               | 9.8                                 | 42                    |                       |                            |
| <u>26</u> † | 0.0               | -1.5              | -0.8               | 18.8                       | 0.0                        | 0.0                               | 0.8                               | 0.8                                 | 48                    |                       |                            |
| <u>27</u> † | 1.0               | -3.5              | -1.3               | 19.3                       | 0.0                        | 0.0                               | 2.8                               | 2.8                                 | 47                    |                       |                            |
| <u>28</u> † | -6.0              | -9.0              | -7.5               | 25.5                       | 0.0                        | 0.0                               | 0.8                               | 0.8                                 | 49                    |                       |                            |
| <u>29</u> † | -7.0              | -16.5             | -11.8              | 29.8                       | 0.0                        | 0.0                               | 2.8                               | 2.8                                 | 47                    |                       |                            |

## Appendix A Daily Data Report for February 2012

Daily Data Report for March 2012

| D           | <u>Max</u>  | <u>Min</u>    | <u>Mean</u>              | <u>Heat</u>  | <u>Cool</u> | <u>Total</u> | <u>Total</u> | <u>Total</u>  | Snow on              | <u>Dir of</u> | <u>Spd of</u> |
|-------------|-------------|---------------|--------------------------|--------------|-------------|--------------|--------------|---------------|----------------------|---------------|---------------|
| a           | <u>Temp</u> | <u>Temp</u>   | <u>Temp</u>              | Deg          | Deg         | <u>Rain</u>  | <u>Snow</u>  | <u>Precip</u> | <u>Grnd</u>          | <u>Max</u>    | Max Gust      |
| у           | <u>د</u>    | <u>ت</u>      | ч <u>с</u>               | Days         | Days        | mm           | cm           | mm            | cm                   | <u>Gust</u>   | кт/п          |
| 01+         | -10.0       | 16 5          | 12.2                     | 21.2         | 0.0         |              | 0.0          | 0.0           | 10                   | IUS deg       | ~             |
| 01          | -10.0       | -10.5<br>20 E | 12.5                     | 20.2         | 0.0         | 0.0          | 0.0          | 0.0           | 40                   |               |               |
| 02+         | -4.0<br>5.0 | -20.5         | -12.5                    | 20.2<br>22.8 | 0.0         | 0.0<br>6.6   | 10.0         | 16.6          | 40                   |               |               |
| 04+         | 5.5         | -14.5         | - <del>4</del> .0<br>1 0 | 17.0         | 0.0         | 0.0          | 14.6         | 14.6          | 44                   |               |               |
| 05+         | -7.0        | -9.0          | -8.0                     | 26.0         | 0.0         | 0.0          | 5 0          | 5 0           | <del>1</del> 0<br>53 |               |               |
| 06+         | -4.0        | -13.0         | -8.5                     | 26.5         | 0.0         | 0.0          | 0.0          | 0.0           | 55                   |               |               |
| 07+         | 5.0         | -12.0         | -3.5                     | 20.5         | 0.0         | 0.0          | 0.0          | 0.0           | J1<br>48             |               |               |
| 08+         | 10 5        | -6.0          | 23                       | 15 7         | 0.0         | 6.0          | 0.0          | 6.0           | 40                   |               |               |
| 09†         | 10.0        | -0.5          | 4.8                      | 13.2         | 0.0         | 0.0          | 0.6          | 0.6           | 38                   |               |               |
| 10+         | -1.5        | -6.0          | -3.8                     | 21.8         | 0.0         | 0.0          | 1.6          | 1.6           | 38                   |               |               |
| 11+         | -2.0        | -9.0          | -5.5                     | 23.5         | 0.0         | 0.0          | 0.4          | 0.4           | 38                   |               |               |
| 12†         | 1.5         | -7.0          | -2.8                     | 20.8         | 0.0         | 0.0          | 0.0          | 0.0           | 34                   |               |               |
| 13†         | -6.0        | -10.5         | -8.3                     | 26.3         | 0.0         | 0.0          | 0.0          | 0.0           | 32                   |               |               |
| 14†         | -1.0        | -14.0         | -7.5                     | 25.5         | 0.0         | 0.0          | 0.0          | 0.0           | 30                   |               |               |
| <u>15</u> † | 2.0         | -11.5         | -4.8                     | 22.8         | 0.0         | 0.0          | 0.0          | 0.0           | 28                   |               |               |
| <u>16</u> † | 7.5         | -7.5          | 0.0                      | 18.0         | 0.0         | 0.0          | 0.0          | 0.0           | 25                   |               |               |
| <u>17</u> † | 4.0         | -2.5          | 0.8                      | 17.2         | 0.0         | 0.0          | 0.4          | 0.4           | 22                   |               |               |
| <u>18</u> † | 8.0         | -2.5          | 2.8                      | 15.2         | 0.0         | 1.2          | 0.0          | 1.2           | 19                   |               |               |
| <u>19</u> † | 2.5         | -0.5          | 1.0                      | 17.0         | 0.0         | 0.0          | 0.0          | 0.0           | 16                   |               |               |
| <u>20</u> † | 3.5         | -2.5          | 0.5                      | 17.5         | 0.0         | 1.2          | 0.0          | 1.2           | 14                   |               |               |
| <u>21</u> † | 1.0         | -4.0          | -1.5                     | 19.5         | 0.0         | 2.2          | 0.0          | 2.2           | 12                   |               |               |
| <u>22</u> † | 6.0         | -2.0          | 2.0                      | 16.0         | 0.0         | 2.2          | 0.0          | 2.2           | 10                   |               |               |
| <u>23</u> † | 0.0         | -2.5          | -1.3                     | 19.3         | 0.0         | 0.0          | 0.0          | 0.0           | 10                   |               |               |
| <u>24</u> † | -4.0        | -5.5          | -4.8                     | 22.8         | 0.0         | 0.0          | 0.0          | 0.0           | 9                    |               |               |
| <u>25</u> † | -4.0        | -8.0          | -6.0                     | 24.0         | 0.0         | 0.0          | 1.8          | 1.8           | 8                    |               |               |
| <u>26</u> † | -1.0        | -5.0          | -3.0                     | 21.0         | 0.0         | 0.0          | 11.6         | 11.6          | 11                   |               |               |
| <u>27</u> † | 0.0         | -4.0          | -2.0                     | 20.0         | 0.0         | 0.0          | 7.6          | 7.6           | 20                   |               |               |
| <u>28</u> † | 0.0         | -3.0          | -1.5                     | 19.5         | 0.0         | 0.0          | 0.0          | 0.0           | 26                   |               |               |
| <u>29</u> † | 4.0         | -3.0          | 0.5                      | 17.5         | 0.0         | 0.0          | 0.0          | 0.0           | 25                   |               |               |

| Daily Data Report for March 2012 |  |
|----------------------------------|--|
|----------------------------------|--|

| D<br>a      | Max<br>Temp<br>°C | Min<br>Temp<br>°C | <u>Mean</u><br><u>Temp</u><br>°C | <u>Heat</u><br>Deg<br>Days | <u>Cool</u><br>Deg<br>Days | <u>Total</u><br><u>Rain</u><br>mm | <u>Total</u><br><u>Snow</u><br>cm | <u>Total</u><br><u>Precip</u><br>mm | Snow on<br>Grnd<br>cm | <u>Dir of</u><br><u>Max</u><br><u>Gust</u> | Spd of<br>Max Gust<br>km/h |
|-------------|-------------------|-------------------|----------------------------------|----------------------------|----------------------------|-----------------------------------|-----------------------------------|-------------------------------------|-----------------------|--|----------------------------|
| У           | ~                 | ~                 | ~                                | ~                          | 2                          | ~                                 | ~                                 | ~                                   | ~                     | 10's deg                                   | ~                          |
| <u>30</u> † | 3.0               | -3.0              | 0.0                              | 18.0                       | 0.0                        | 0.0                               | 0.0                               | 0.0                                 | 23                    |  |                            |
| <u>31</u> † | 0.0               | -3.0              | -1.5                             | 19.5                       | 0.0                        | 0.0                               | 0.0                               | 0.0                                 | 22                    |  |                            |

## Daily Data Report for April 2012

| D<br>a      | <u>Max</u><br>Temp | <u>Min</u><br>Temp | <u>Mean</u><br>Temp | <u>Heat</u><br>Deg | <u>Cool</u><br>Deg | <u>Total</u><br><u>Rain</u> | <u>Total</u><br>Snow | <u>Total</u><br><u>Precip</u> | <u>Snow on</u><br><u>Grnd</u> | <u>Dir of</u><br><u>Max</u> | <u>Spd of</u><br><u>Max Gust</u> |
|-------------|--------------------|--------------------|---------------------|--------------------|--------------------|-----------------------------|----------------------|-------------------------------|-------------------------------|-----------------------------|----------------------------------|
| y           | °C<br>M            | °C<br>M            | °C<br>M             | Days<br>M          | Days<br>M          | mm<br>M                     | cm<br>M              | mm<br>M                       | cm<br>M                       | <u>Gust</u><br>10's deg     | km/h                             |
| <u>01</u> † | 1.0                | -7.5               | -3.3                | 21.3               | 0.0                | 0.0                         | 0.0                  | 0.0                           | 20                            |                             |                                  |
| <u>02</u> † | 3.0                | -4.0               | -0.5                | 18.5               | 0.0                | 0.0                         | 0.0                  | 0.0                           | 20                            |                             |                                  |
| <u>03</u> † | 3.0                | -7.5               | -2.3                | 20.3               | 0.0                | 0.0                         | 8.8                  | 8.8                           | 18                            |                             |                                  |
| <u>04</u> † | 3.0                | -3.5               | -0.3                | 18.3               | 0.0                | 0.0                         | 2.2                  | 2.2                           | 24                            |                             |                                  |
| <u>05</u> † | 3.5                | 0.5                | 2.0                 | 16.0               | 0.0                | 0.9                         | 0.0                  | 0.9                           | 20                            |                             |                                  |
| <u>06</u> † | 3.5                | 1.0                | 2.3                 | 15.7               | 0.0                | 0.0                         | 0.0                  | 0.0                           | 17                            |                             |                                  |
| <u>07</u> † | 6.5                | -3.5               | 1.5                 | 16.5               | 0.0                | 10.4                        | 0.0                  | 10.4                          | 10                            |                             |                                  |
| <u>08</u> † | 7.0                | 0.0                | 3.5                 | 14.5               | 0.0                | 0.4                         | 0.0                  | 0.4                           | 6                             |                             |                                  |
| <u>09</u> † | 9.0                | 1.5                | 5.3                 | 12.7               | 0.0                | 2.0                         | 0.0                  | 2.0                           | 2                             |                             |                                  |
| <u>10</u> † | 13.0               | 3.0                | 8.0                 | 10.0               | 0.0                | 4.4                         | 0.0                  | 4.4                           | 0                             |                             |                                  |
| <u>11</u> † | 14.0               | 4.0                | 9.0                 | 9.0                | 0.0                | 2.2                         | 0.0                  | 2.2                           | 0                             |                             |                                  |
| <u>12</u> † | 3.0                | 1.0                | 2.0                 | 16.0               | 0.0                | 0.0                         | 2.0                  | 2.0                           | 0                             |                             |                                  |
| <u>13</u> † | 2.0                | -1.0               | 0.5                 | 17.5               | 0.0                | 0.0                         | 4.4                  | 4.5                           | 1                             |                             |                                  |
| <u>14</u> † | 9.0                | -2.0               | 3.5                 | 14.5               | 0.0                | 0.0                         | 0.0                  | 0.0                           | 1                             |                             |                                  |
| <u>15</u> † | 9.0                | -1.0               | 4.0                 | 14.0               | 0.0                | 0.0                         | 0.0                  | 0.0                           | 0                             |                             |                                  |
| <u>16</u> † | 19.5               | 5.0                | 12.3                | 5.7                | 0.0                | 0.0                         | 0.0                  | 0.0                           | 0                             |                             |                                  |
| <u>17</u> † | 21.0               | 11.0               | 16.0                | 2.0                | 0.0                | 2.2                         | 0.0                  | 2.2                           | 0                             |                             |                                  |