3-16-2016

Water Quality Monitoring Program for Islamorada, Village of Islands, Florida Keys- Preliminary Report #1: Canal Water Characterization and Monitoring

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WATER QUALITY MONITORING PROGRAM FOR ISLAMORADA, VILLAGE OF ISLANDS, FLORIDA KEYS

Preliminary Report #1: Canal Water Characterization and Monitoring

March 16, 2016

Presented to:
City of Islamorada, Village of Islands Water Quality Improvement Citizens' Advisory Committee

Henry O. Briceño, Alexandra Serna, Michael Absten, Sandro Stumpf, James Duquesnel
**Objective**

- To assess the improvements in water quality (WQ) derived from remediation activities, especially linked to the installation of wastewater collection systems

**Conceptual model**

- The project has been developed as a Before-and-After-Control-Impact scheme (BACI) with multiple sites and includes an initial characterization and periodic monitoring afterwards.
A priori classification

- The five selected canals have been subdivided in 3 classes (Class A, B, and C) based on the estimated % of properties connected to the wastewater network

Canal #118

Canal #120

FIU photos by A. Serna (Feb. 2016)
Class A: Estimate is 90 to 95% of properties connected to sewer collection system to date by canal. Units connected to the system for many years.

Canal #114 located at Harbor Drive, Plantation Key.

Canal #118 located at Azalea Street, Plantation Key.
**Class B:** Estimate is 50% of properties connected to sewer collection system to date by canal. Units connected to the system since March 2015

**Canal #120** located at Sioux Street, Plantation Key.
Class C: No properties connected to sewer collection system to date

Canal #145 located at Columbus Drive, Lower Matecumbe

Canal #152 located at Venetian Drive, Lower Matecumbe
Water quality testing parameters

Water quality has been monitored using a framework of:

- Vertical profiles
- Continuous 24-hour recording (Diels) of physical-chemical data:
  * Dissolved Oxygen (DO)
  * % DO saturation (%DO sat)
  * pH
  * Temperature
  * Salinity
  * Specific conductivity
  * Turbidity

%DO sat exceedances are calculated as the daily average %DO sat below 42% saturation in a full day of diel data (Rule 62-302.533 of the Florida Administrative Code for Dissolved Oxygen).

- Water sampling and analysis for dissolved and total nutrients in Surface and Bottom waters.
Monitoring plan summary

- Initially, several stations were sampled at each canals to characterize the canals and then the best sites were selected for future work.
- Once the stations were selected quarterly monitoring followed, and will continue until completion of the project.

<table>
<thead>
<tr>
<th>Characterization</th>
<th>Quarterly monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC-00 8/12/2015</td>
<td>IC-02 2/4/2016</td>
</tr>
<tr>
<td>IC-01 10/21/2015</td>
<td></td>
</tr>
<tr>
<td>IC-00 8/13/2015</td>
<td>IC-02 2/18/2016</td>
</tr>
<tr>
<td>IC-01 10/22/2015</td>
<td></td>
</tr>
<tr>
<td>IC-01 10/23/2015</td>
<td></td>
</tr>
</tbody>
</table>
# Results of diel recording of physicochemical properties in Surface waters in the five selected canals.

<table>
<thead>
<tr>
<th></th>
<th>Canal:</th>
<th>114</th>
<th>118</th>
<th>120</th>
<th>145</th>
<th>152</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Temperature</td>
<td>ºC</td>
<td>27.83</td>
<td>28.13</td>
<td>27.75</td>
<td>28.38</td>
<td>29.25</td>
</tr>
<tr>
<td>Surface Specific</td>
<td>mS/cm</td>
<td>53.38</td>
<td>54.98</td>
<td>54.42</td>
<td>52.81</td>
<td>55.09</td>
</tr>
<tr>
<td>Conductivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Salinity</td>
<td>ppt</td>
<td>35.15</td>
<td>36.34</td>
<td>35.94</td>
<td>34.72</td>
<td>36.39</td>
</tr>
<tr>
<td>Surface pH</td>
<td></td>
<td>7.54</td>
<td>7.72</td>
<td>7.80</td>
<td>7.40</td>
<td>7.54</td>
</tr>
<tr>
<td>Surface Turbidity</td>
<td>NTU</td>
<td>5.44</td>
<td>9.28</td>
<td>1.95</td>
<td>4.32</td>
<td>0.51</td>
</tr>
<tr>
<td>Surface DO Sat</td>
<td>%</td>
<td>31.00</td>
<td>73.91</td>
<td>84.40</td>
<td>48.15</td>
<td>39.03</td>
</tr>
<tr>
<td>Surface DO</td>
<td>mg/l</td>
<td>2.00</td>
<td>4.71</td>
<td>5.43</td>
<td>3.08</td>
<td>2.44</td>
</tr>
<tr>
<td>%DO Sat Exceedances</td>
<td>%</td>
<td>66%</td>
<td>0%</td>
<td>0%</td>
<td>45%</td>
<td>64%</td>
</tr>
</tbody>
</table>

Values are the average of measurements every 10 minutes during 24-h tests in Surface water in the five selected canals.
Surface waters of canals #118 and #120 are well oxygenated with all values above 42 %DO saturation (no %DO saturation exceedances).

Values are the results from diel measurements during survey IC-01 conducted in October 2015.
Results of diel recording of physicochemical properties in Bottom waters in the five selected canals.

<table>
<thead>
<tr>
<th></th>
<th>Canal:</th>
<th>114</th>
<th>118</th>
<th>120</th>
<th>145</th>
<th>152</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom Temperature</td>
<td>ºC</td>
<td>27.22</td>
<td>27.80</td>
<td>27.89</td>
<td>26.40</td>
<td>28.91</td>
</tr>
<tr>
<td>Bottom Specific Conductivity</td>
<td>mS/cm</td>
<td>57.11</td>
<td>56.70</td>
<td>56.02</td>
<td>55.41</td>
<td>54.29</td>
</tr>
<tr>
<td>Bottom Salinity</td>
<td>ppt</td>
<td>37.96</td>
<td>37.63</td>
<td>37.13</td>
<td>36.71</td>
<td>35.80</td>
</tr>
<tr>
<td>Bottom pH</td>
<td></td>
<td>7.16</td>
<td>7.11</td>
<td>7.50</td>
<td>7.12</td>
<td>7.33</td>
</tr>
<tr>
<td>Bottom Turbidity</td>
<td>NTU</td>
<td>0.73</td>
<td>2.78</td>
<td>2.69</td>
<td>1.25</td>
<td>1.63</td>
</tr>
<tr>
<td>Bottom DO Sat</td>
<td>%</td>
<td>0.35</td>
<td>0.90</td>
<td>16.98</td>
<td>0.27</td>
<td>20.82</td>
</tr>
<tr>
<td>Bottom DO</td>
<td>mg/l</td>
<td>0.02</td>
<td>0.06</td>
<td>1.08</td>
<td>0.02</td>
<td>1.32</td>
</tr>
<tr>
<td>%DO Sat Exceedances</td>
<td>%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Values are the average of measurements every 10 minutes during 24-h tests in Bottom water in the five selected canals.
%DO saturation in Bottom waters of all canals exceed the regulation levels (all values below 42 %DO saturation)

Values are the results from diel measurements during survey IC-01 conducted in October 2015.
Results of vertical profiles

In this example: **Canal #114** located at Harbor Drive, Plantation Key.

Seasonal variability (dates of surveys) is clearly observed in the canals.
Tentative work schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 2015</td>
<td>✓ Survey IC-00 Characterization</td>
</tr>
<tr>
<td>Oct. 2015</td>
<td>✓ Survey IC-01 Characterization</td>
</tr>
<tr>
<td>Feb. 2016</td>
<td>✓ Survey IC-02 Quarterly monitoring</td>
</tr>
<tr>
<td>May 2016</td>
<td>Survey IC-03 Quarterly monitoring</td>
</tr>
<tr>
<td>Aug. 2016</td>
<td>Survey IC-04 Quarterly monitoring</td>
</tr>
<tr>
<td>Nov. 2016</td>
<td>Survey IC-05 Quarterly monitoring</td>
</tr>
</tbody>
</table>
## Tentative deliverables schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Due date following work execution</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characterization IC-00</td>
<td>8 weeks</td>
<td>Initial progress report</td>
</tr>
<tr>
<td>Characterization IC-01</td>
<td>8 weeks</td>
<td>Preliminary results Characterization Phase IC-00 and IC-01</td>
</tr>
<tr>
<td>Quarterly monitoring IC-02</td>
<td>12 weeks</td>
<td>Progress report</td>
</tr>
<tr>
<td>Quarterly monitoring IC-03</td>
<td>12 weeks</td>
<td>Progress report</td>
</tr>
<tr>
<td>Quarterly monitoring IC-04</td>
<td>12 weeks</td>
<td>Progress report</td>
</tr>
<tr>
<td>Quarterly monitoring IC-05</td>
<td>12 weeks</td>
<td>Annual report</td>
</tr>
</tbody>
</table>