5-2016

Water Quality Monitoring Project for Demonstration of Canal Remediation Methods Florida Keys- Preliminary Report #3: Assessment of Canal Remediation Methods Canal using Water Quality Data Before and After Remediation

Henry O. Briceño
Florida International University, bricenoh@fiu.edu

Alexandra Serna
Florida International University

Florida International University
Florida International University

Sandro Stumpf
Florida International University

James Duquesnel
Florida International University

Follow this and additional works at: https://digitalcommons.fiu.edu/sercrp

WATER QUALITY MONITORING PROJECT FOR DEMONSTRATION OF CANAL REMEDIATION METHODS FLORIDA KEYS

Preliminary Report #3: Assessment of Canal Remediation Methods Canal using Water Quality Data Before and After Remediation

May 6, 2016

Presented to:
Water Quality Program Canal Restoration Advisory Committee

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

Objective
- To provide data needed to make unbiased, statistically rigorous statements about the status and temporal trends of water quality parameters in the remediated canals

Conceptual model
The execution of the project includes two phases:
1) Before remediation
2) After remediation

Water quality testing parameters

- Vertical profiles

- Continuous 24-hour recording (Diels) of physical-chemical data:

%DO (Dissolved Oxygen) sat exceedances calculations: % readings below 42% saturation in a full day of diel data

- Water sampling for total nutrients analysis

Demonstration canals included in this report

FIU photo by J. Duquesnel – Canal #472

- Canal #29 in Key Largo. Backfilled to reduce canal depth

- Canal #137 in Plantation Key. A weed barrier was installed to prevent input of wrack

- Canal #472 in Geiger Key. A culvert was installed to enhance circulation

Water quality criteria

- 62-302.533 DO (Dissolved Oxygen) criteria for Class III Waters
- 62-302.532 Estuary-Specific Criterion for Total Phosphorus (TP) and Total Nitrogen (TN), by biogeochemical subdivisions of South Florida coastal and estuarine waters (Briceno et al, 2013)

Canal #29 — Manatee Bay-Barnes Sound segment of Biscayne Bay

Canal #137 — Middle Keys

Canal #472 — Lower Keys

Canal #29. Remediation technology: Backfilling. Completed Jul-15

		SHORT TERM				LONG TERM
		Pre-remediation		Post-remediation		
CRITERIA	Depth	31-Mar-14	16-Oct-14	4-Feb-16	28-Apr-16	
No more than 10% of the daily measured values should fall below 42 %DO saturation	S	0%	0% ◀▶	0% ◀▶	0% ◀▶	
	B	43%	100% ▲	0% ▼	0% ◀▶	**No definitive improving trend yet**

LEGEND

◀▶ Stable within favorable range	◀▶ Stable within negative range	Depth	Water sample depth
▼ Declining within favorable range	▼ Declining within negative range	SHORT TERM	Relative position of last survey
▲ Improving within favorable range	▲ Increasing within negative range	LONG TERM	Linear trend for whole period of record

S: Surface water   Measurements ~ 2 ft below water surface

B: Bottom water   Measurements ~ 1ft above canal bottom

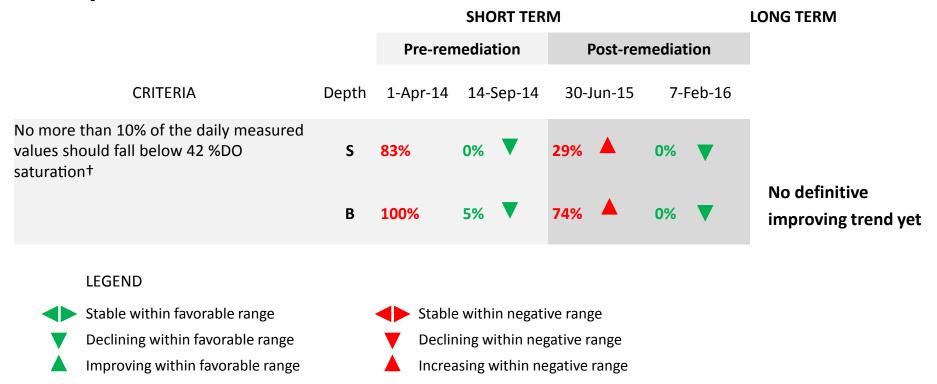† A full day of diel data consist of 24 hours of measurements collected every 10 min

- Surface waters in compliance during the whole monitoring period
- Post-remediation surveys showed %DO saturation in compliance in shallower new bottom waters

Canal #29. Remediation technology: Backfilling. Completed Jul-15

				SHORT TERM			LONG TERM
				Pre-remediation		**Post-remediation**	
	CRITERIA	Depth	31-Mar-14	16-Oct-14		4-Feb-16	
TP	less than 0.007 ppm†	S	0.021	0.004 ▼		0.043 ▲	
		B	0.030	0.003 ▼		0.045 ▲	
TN	less than 0.58 ppm†	S	0.28	0.62 ▲		0.51 ▼	
		B	0.39	0.59 ▲		0.51 ▼	

No definitive improving trend yet

◄► Stable within favorable range   ◄► Stable within negative range

▼ Declining within favorable range   ▼ Declining within negative range

▲ Improving within favorable range   ▲ Increasing within negative range

†Manatee Bay-Barnes Sound segment of Biscayne Bay

- First post-remediation survey rendered TP concentrations out of compliance
- Surface and Bottom TN concentrations in compliance after remediation

Canal #137. Remediation technology: Weed gate installation. Completed Nov-14

| | | | SHORT TERM | | | LONG TERM |
| | | Pre-remediation | | Post-remediation | | |
CRITERIA	Depth	1-Apr-14	14-Sep-14	30-Jun-15	7-Feb-16	
No more than 10% of the daily measured values should fall below 42 %DO saturation†	S	83%	0% ▼	29% ▲	0% ▼	**No definitive improving trend yet**
	B	100%	5% ▼	74% ▲	0% ▼	

LEGEND

◀▶ Stable within favorable range   ◀▶ Stable within negative range

▼ Declining within favorable range   ▼ Declining within negative range

▲ Improving within favorable range   ▲ Increasing within negative range
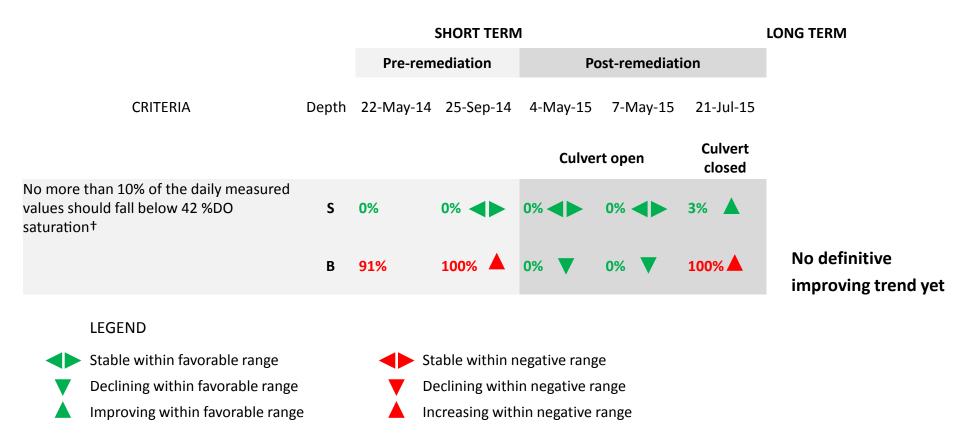
Second post-remediation survey showed both surface and bottom waters %DO saturation in compliance

Canal #137. Remediation technology: Weed gate installation. Completed Nov-14

			SHORT TERM				LONG TERM
			Pre-remediation		**Post-remediation**		
	CRITERIA	Depth	1-Apr-14	14-Sep-14	30-Jun-15	7-Feb-16	
TP	less than 0.007 ppm	S	0.028	0.010 ▼	0.019 ▲	0.020 ▲	
		B	0.027	0.010 ▼	0.018 ▲	0.019 ▲	
TN	less than 0.22 ppm	S	0.12	0.35 ▲	0.20 ▼	0.37 ▲	**No definitive improving trend yet**
		B	0.12	0.34 ▲	0.19 ▼	0.28 ▲	

LEGEND

◄► Stable within favorable range   ◄► Stable within negative range

▼ Declining within favorable range   ▼ Declining within negative range

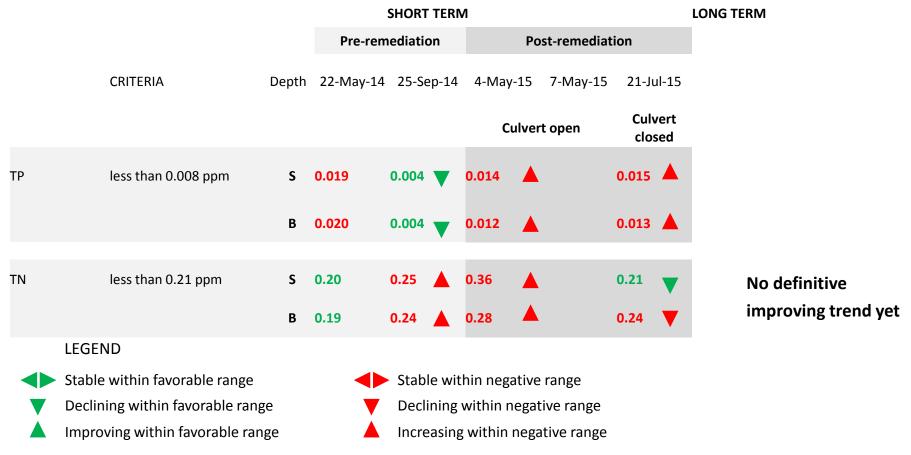▲ Improving within favorable range   ▲ Increasing within negative range

- Post-remediation surveys rendered TP concentrations out of compliance
- Surface and Bottom TN concentrations returned to out of compliance in Feb-16

Canal #472. Remediation technology: Culvert installation. Completed May-15 and was closed shortly after

		SHORT TERM					LONG TERM
		Pre-remediation		Post-remediation			
CRITERIA	Depth	22-May-14	25-Sep-14	4-May-15	7-May-15	21-Jul-15	
				Culvert open		Culvert closed	
No more than 10% of the daily measured values should fall below 42 %DO saturation†	S	0%	0% ◄►	0% ◄►	0% ◄►	3% ▲	No definitive improving trend yet
	B	91%	100% ▲	0% ▼	0% ▼	100% ▲	

LEGEND

◄► Stable within favorable range   ◄► Stable within negative range
▼ Declining within favorable range   ▼ Declining within negative range
▲ Improving within favorable range   ▲ Increasing within negative range

Post-remediation surveys showed %DO saturation in compliance and a return to values out of compliance in bottom waters after the culvert was closed

Canal #472. Remediation technology: Culvert installation. Completed May-15 and was closed shortly after

				SHORT TERM			LONG TERM
			Pre-remediation		Post-remediation		
CRITERIA	Depth	22-May-14	25-Sep-14	4-May-15	7-May-15	21-Jul-15	
				Culvert open		Culvert closed	
TP less than 0.008 ppm	S	0.019	0.004 ▼	0.014 ▲		0.015 ▲	
	B	0.020	0.004 ▼	0.012 ▲		0.013 ▲	
TN less than 0.21 ppm	S	0.20	0.25 ▲	0.36 ▲		0.21 ▼	No definitive improving trend yet
	B	0.19	0.24 ▲	0.28 ▲		0.24 ▼	

LEGEND

◀▶ Stable within favorable range   ◀▶ Stable within negative range

▼ Declining within favorable range   ▼ Declining within negative range

▲ Improving within favorable range   ▲ Increasing within negative range

- Post-remediation surveys rendered TP concentrations out of compliance
- TN concentrations in bottom water have bounced in and out of compliance

Score cards by canal

http://serc.fiu.edu/wqmnetwork/Canals/index.htm

Canal #29

Canal #137

Canal #472