Canal Water Quality Committee Meeting
Agenda – July 1, 2010

1. Results from three years of Citizen Water Quality Monitoring
2. Summary of *Pollution & Stormwater Control Strategy For The Anchorage Canal Drainage Area* Study
3. Update on grant to the CIB to implement two recommendations from the above study
4. Update on the cleaning out of the Anchorage Forebay
5. Educational Opportunities:
6. Citizen Monitoring
7. Oyster Gardening
8. Review and discussion of potential Retrofits

Results From Citizen Monitoring In South Bethany's Canals 2008, 2009, 2010

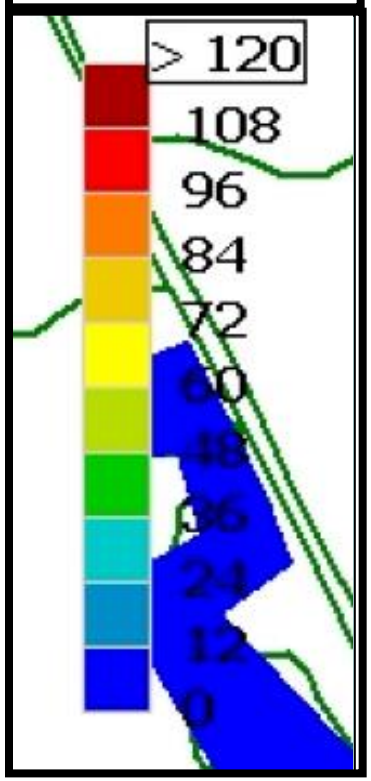
- The Water Testing Program
- Our Dead End Canals Do Not Get Flushed By The Tides

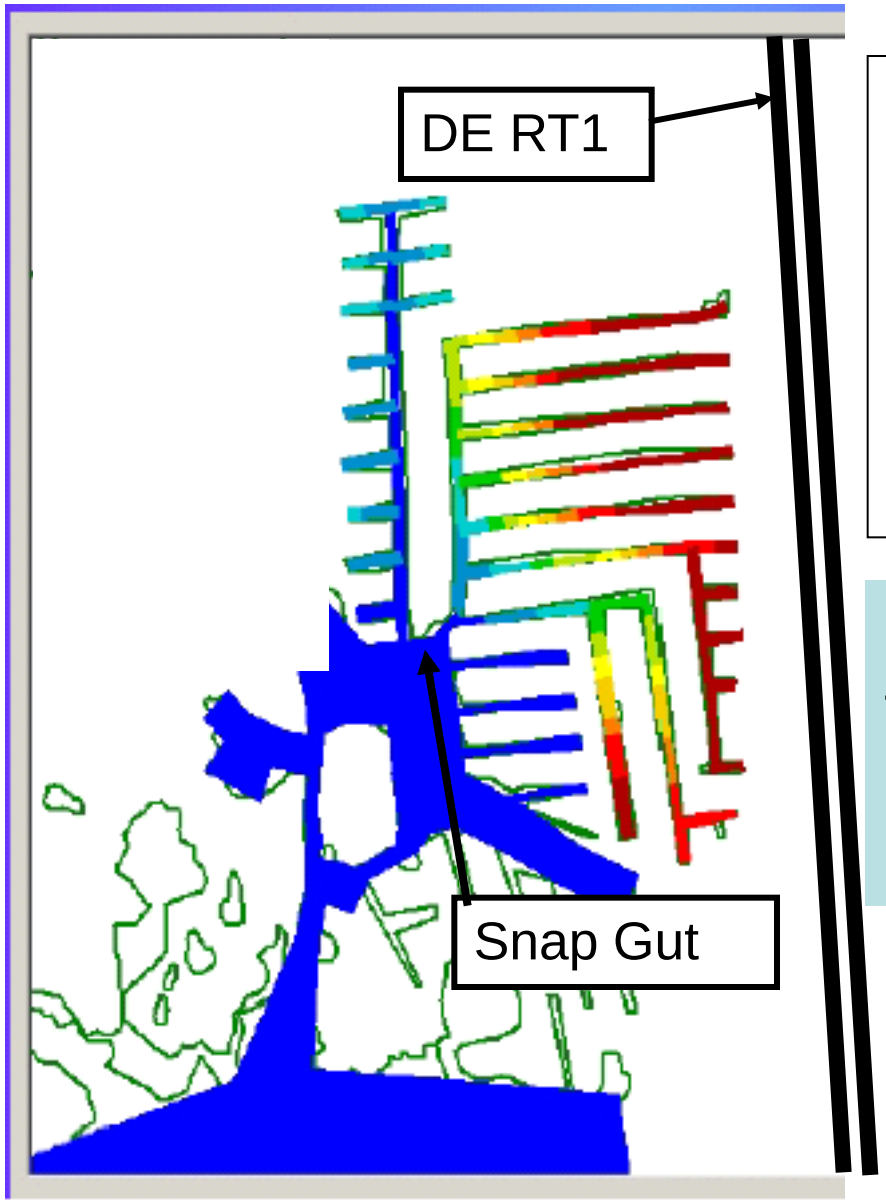
• Dissolved Oxygen	2008, 2009, 2010
• Bacteria	2008, 2009
• Dissolved Inorganic Nitrogen	2008. 2009
• Dissolved Inorganic Phosphorous	2008, 2009
• Total Suspended Solids	2008, 2009
• Chlorophyll a	2008, 2009

What we put in our canals stays there for many months.

South Bethany Canals Flushing Study – *Entrix 2005* – Shows That There Is Essentially No Flushing In The Canals Far From Snap Gut.

Residence Times in Days

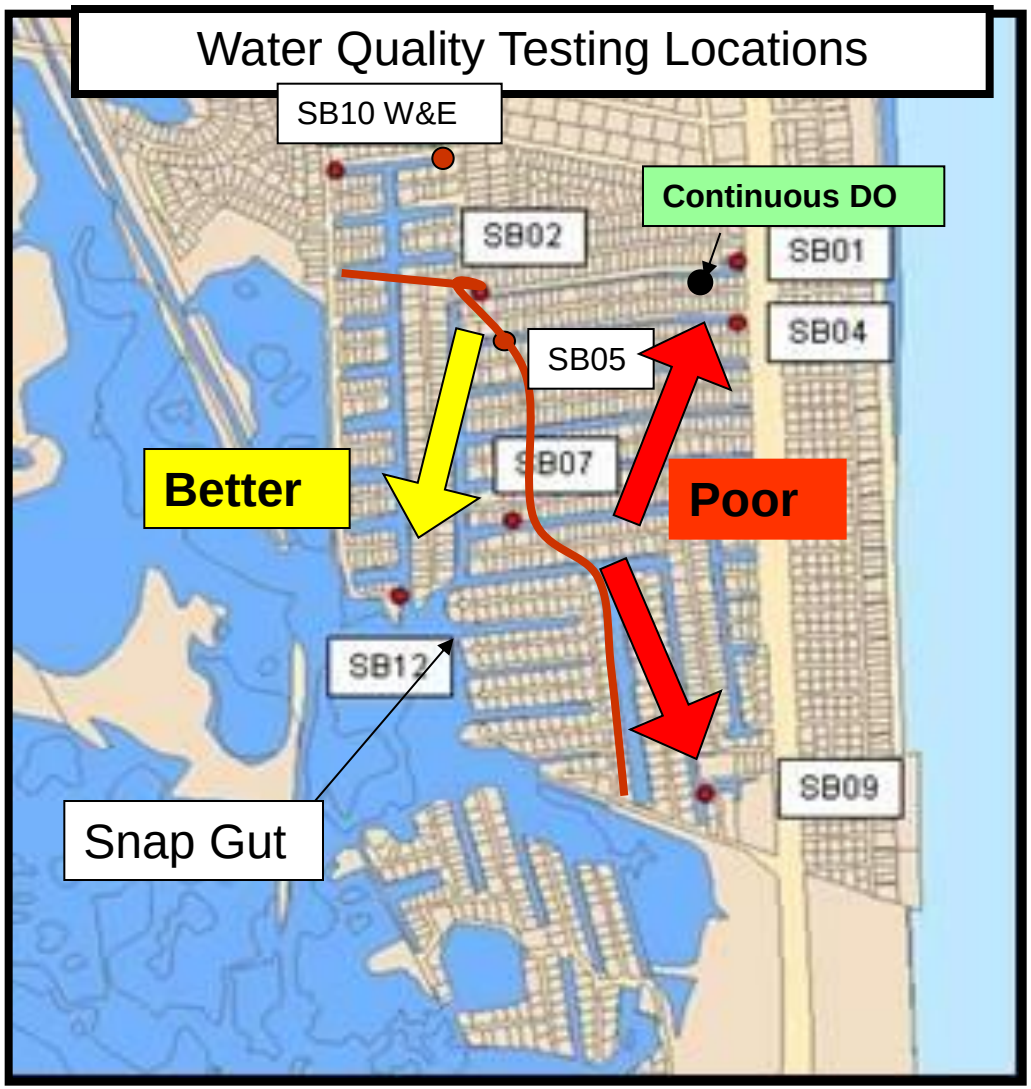




Residence time is defined as the time it takes to reduce a concentration by 36.79%

Residence times for areas far from snap gut are well over 3 months

Dave Wilson is Leading a Group to Monitor Water Quality in the South Bethany Canals

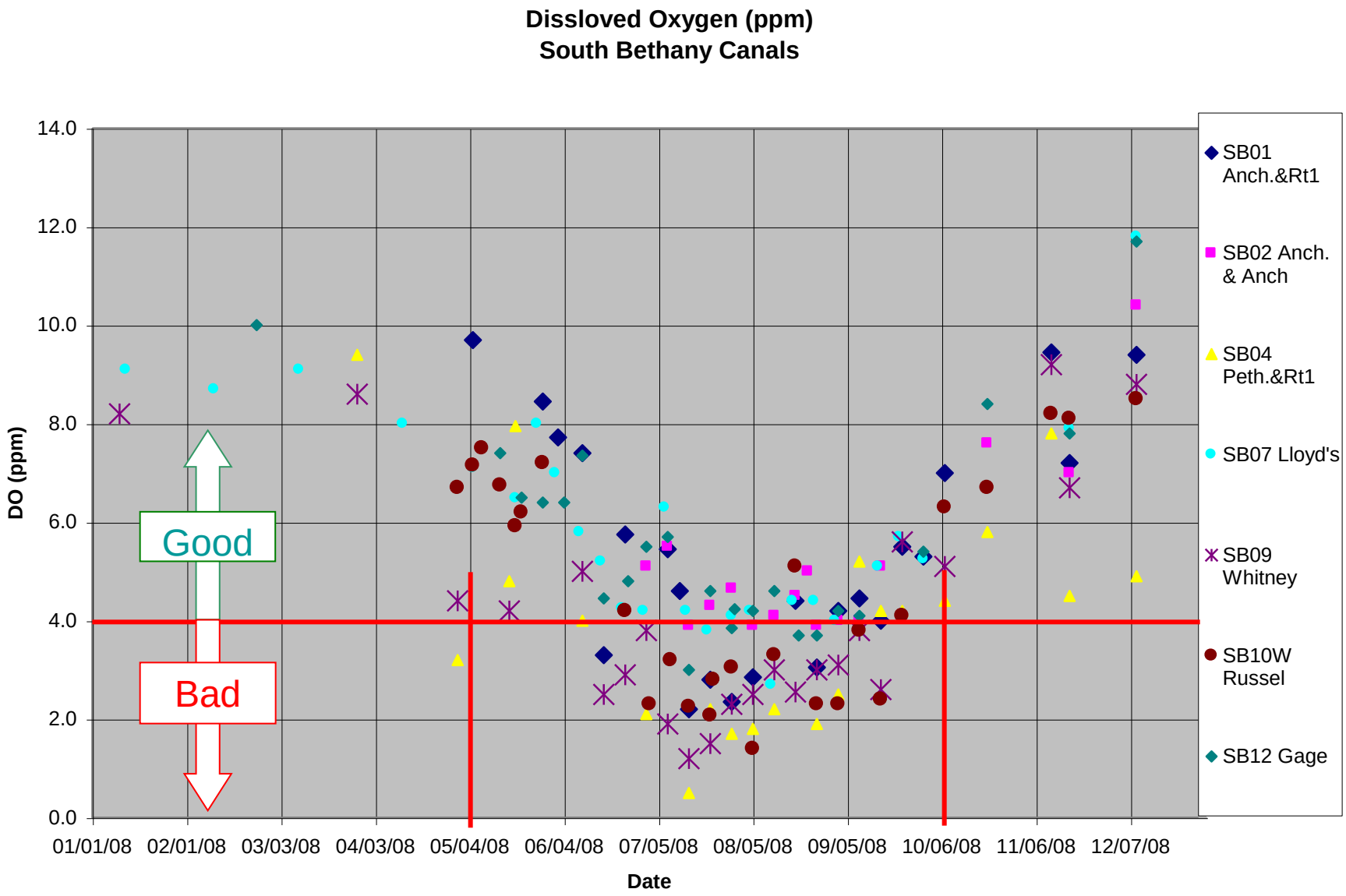


Quantities to be monitored:

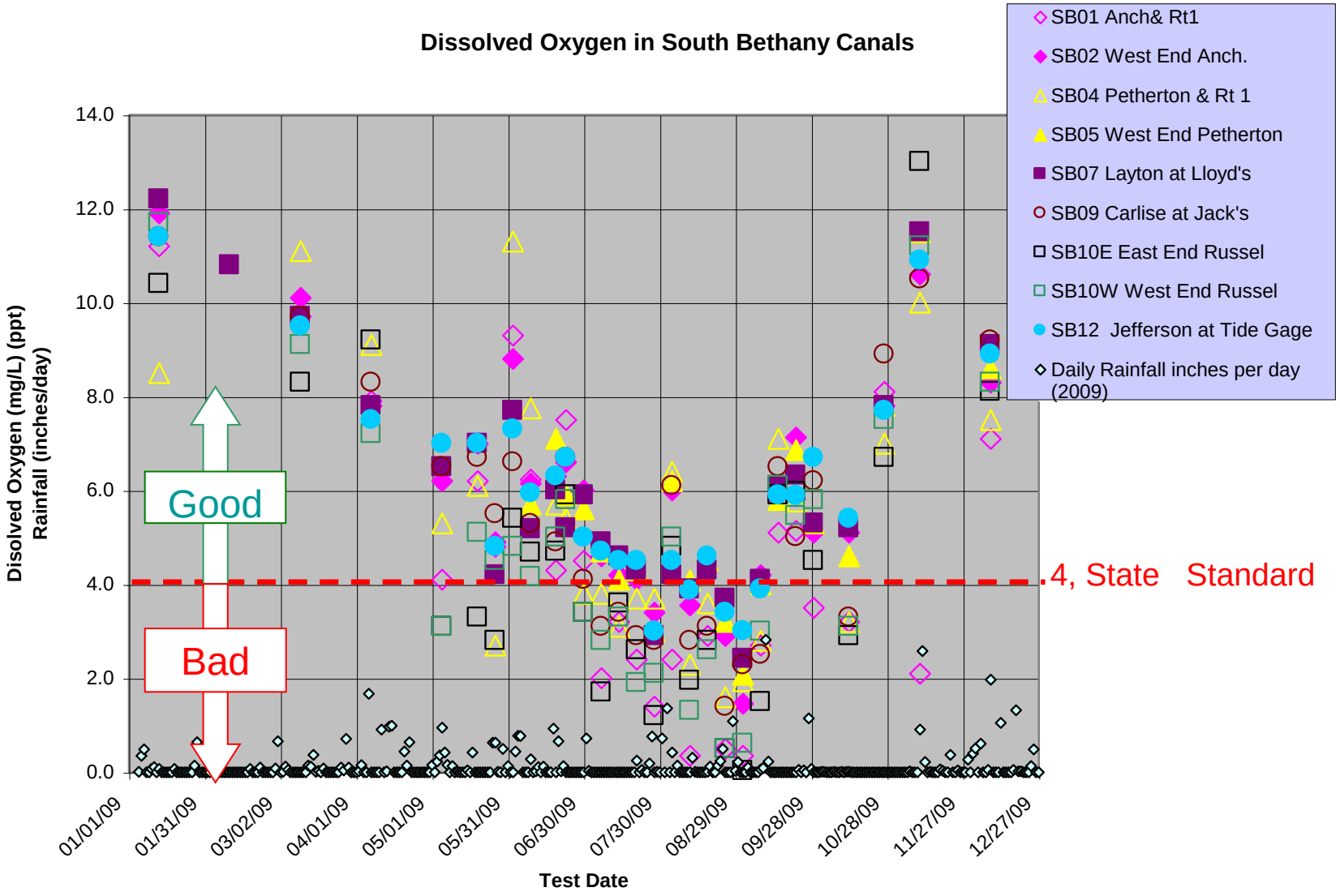
- For "Fishable" Waters
  - Dissolved Oxygen
  - Water Temperature
  - Salinity
  - Nitrogen and Phosphorus
  - Secchi Depth
- For "Swimmable" Waters
  - Bacteria
- Storm Water Influence
  - Collect accurate local rain data

The farther removed from Snap Gut, the poorer the quality of water.

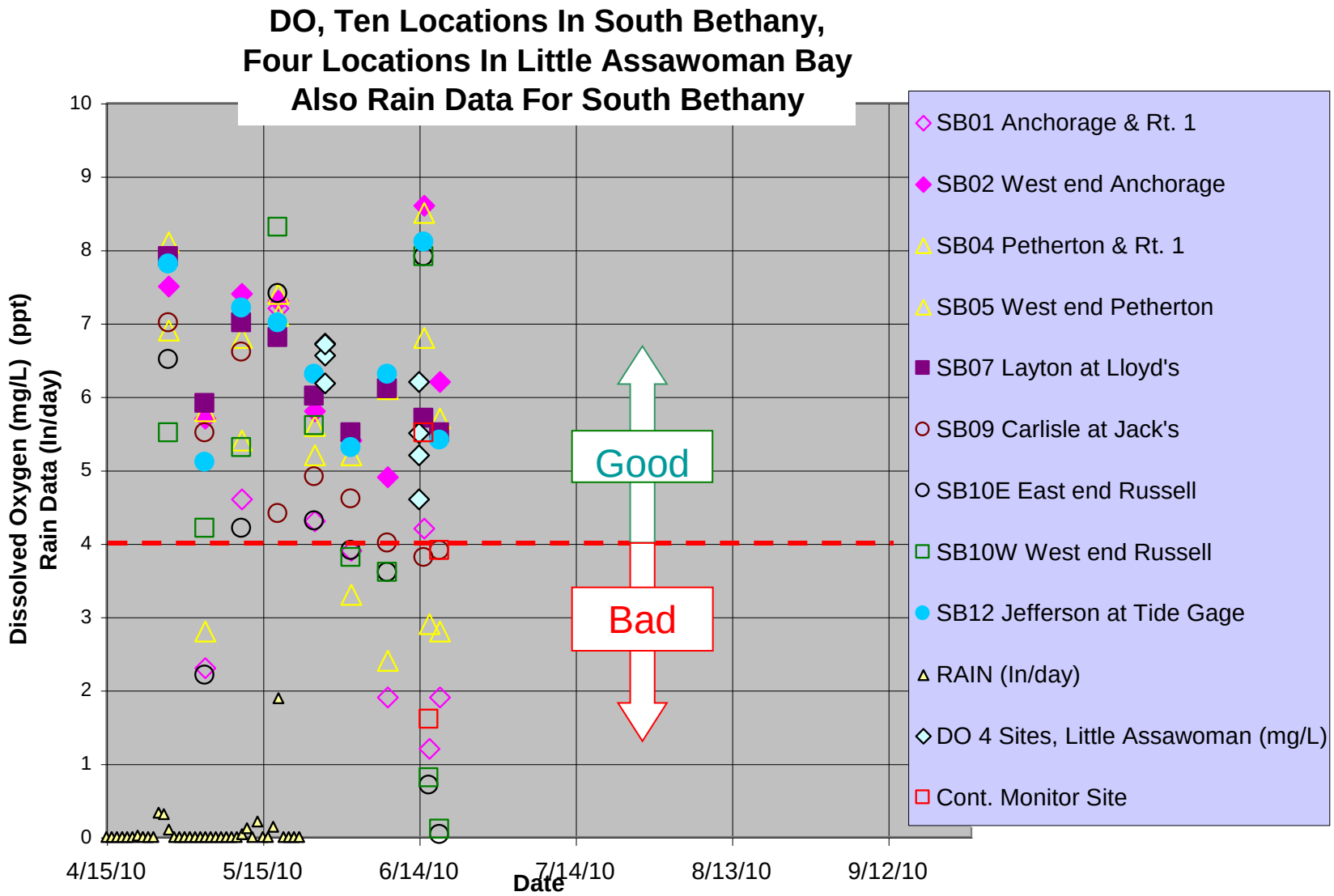
2008 DO Levels in South Bethany Canals – The DO Is Too Low In The Summer



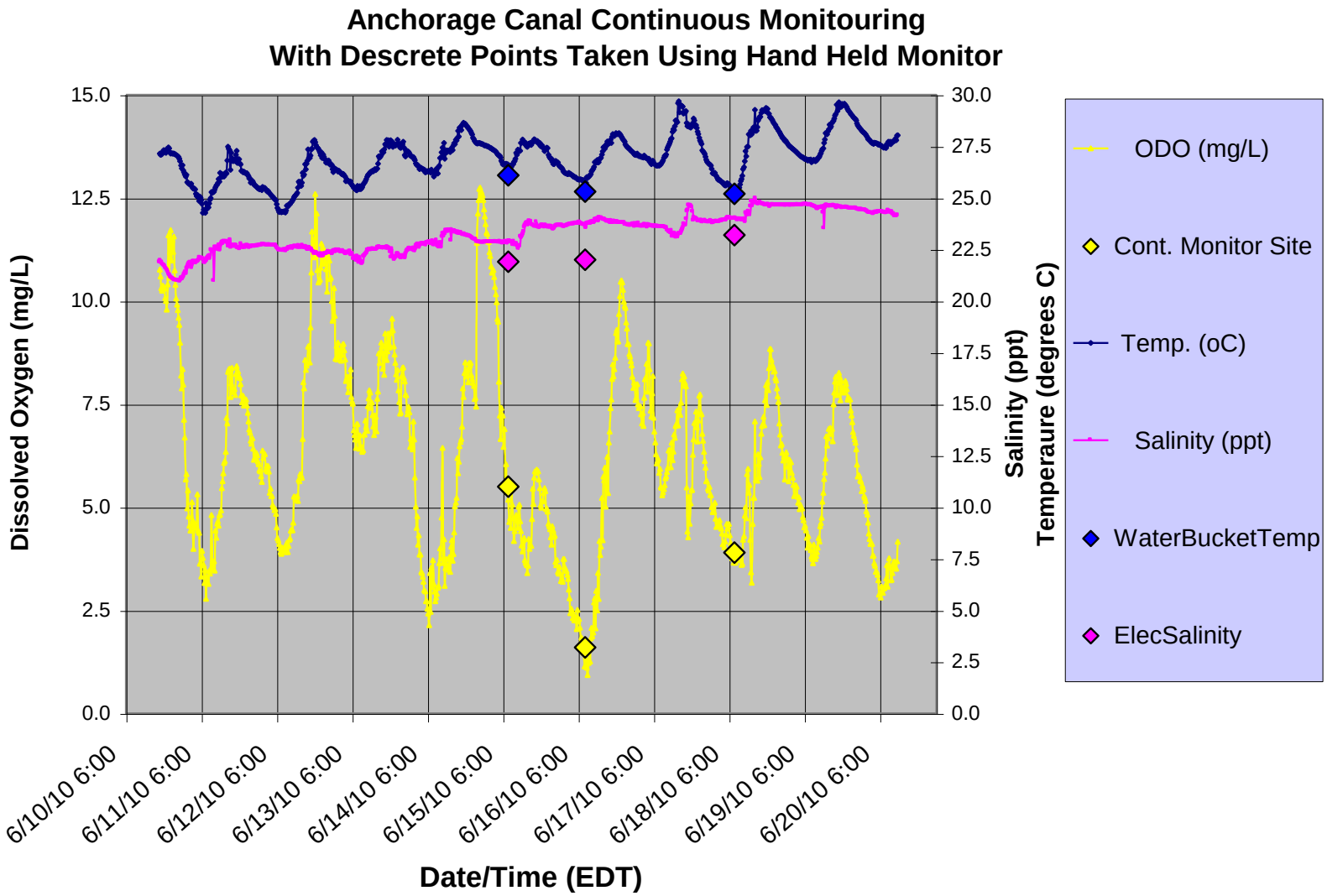
2009 DO Levels in South Bethany Canals – The Unfilled Markers Are Furthest From Snap Gut



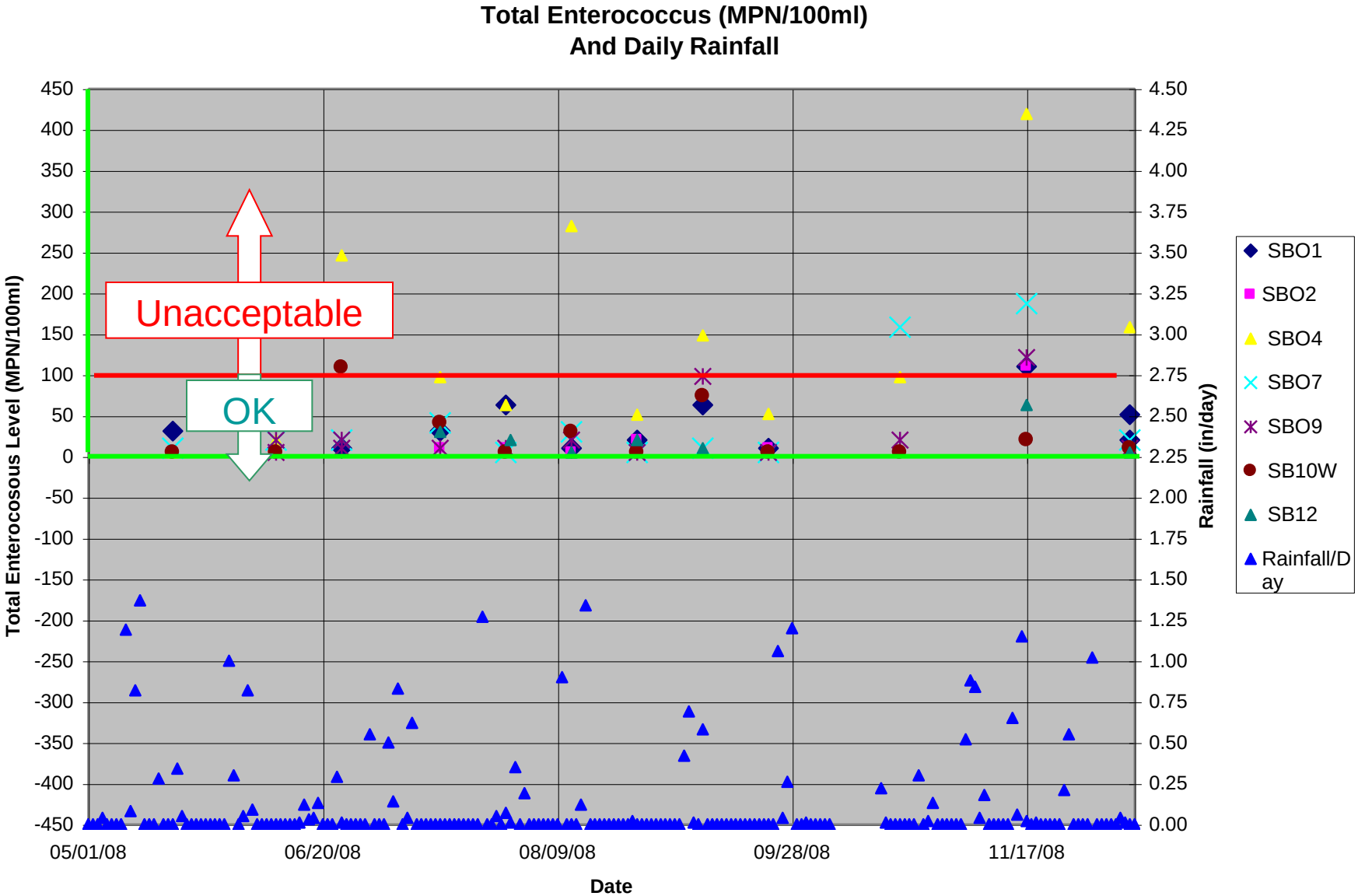
2010 DO Levels in South Bethany Canals – The Unfilled Markers Are Furthest From Snap Gut



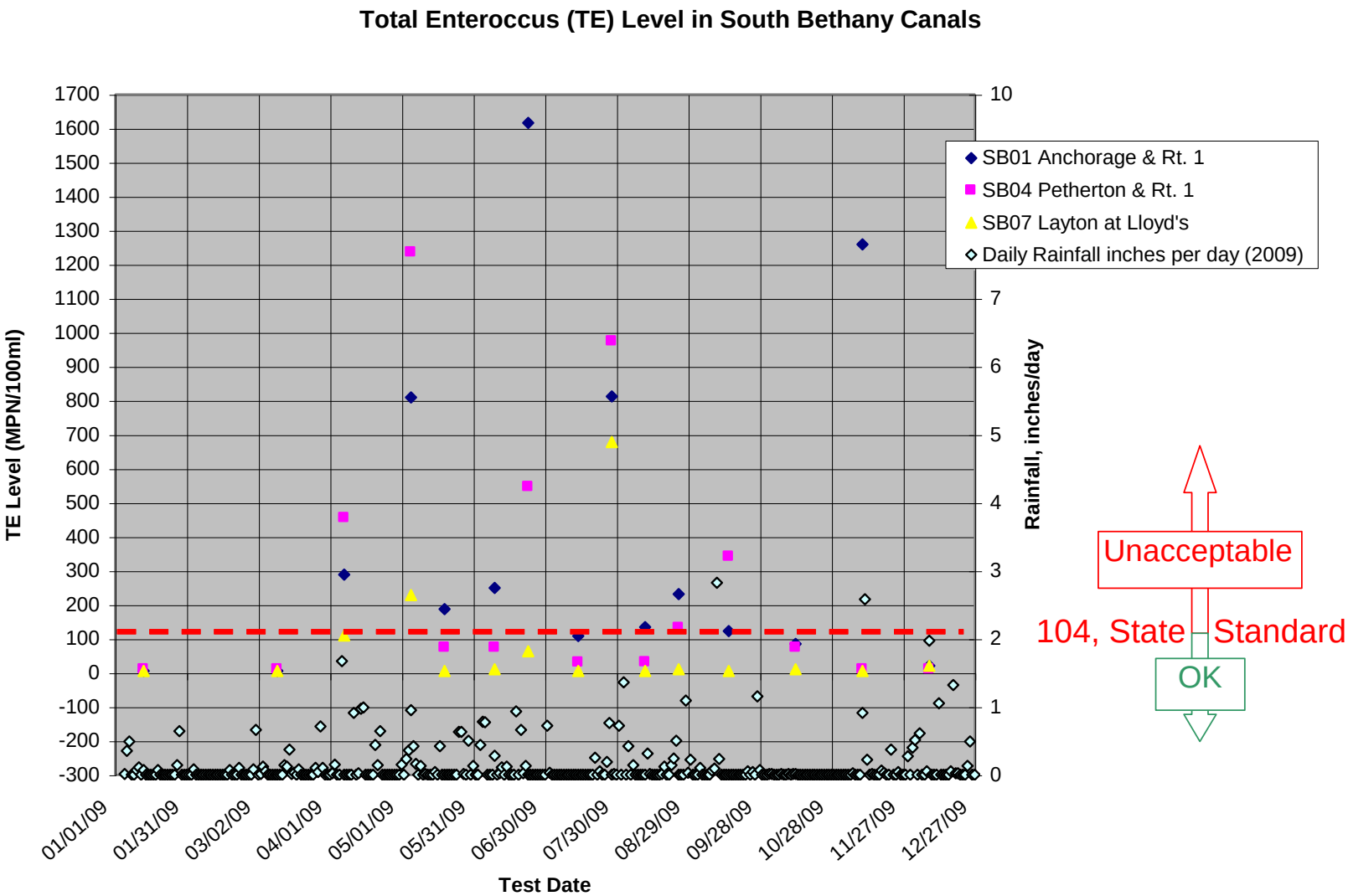
Hand Held Monitor Agrees Well With The Continuous Monitor



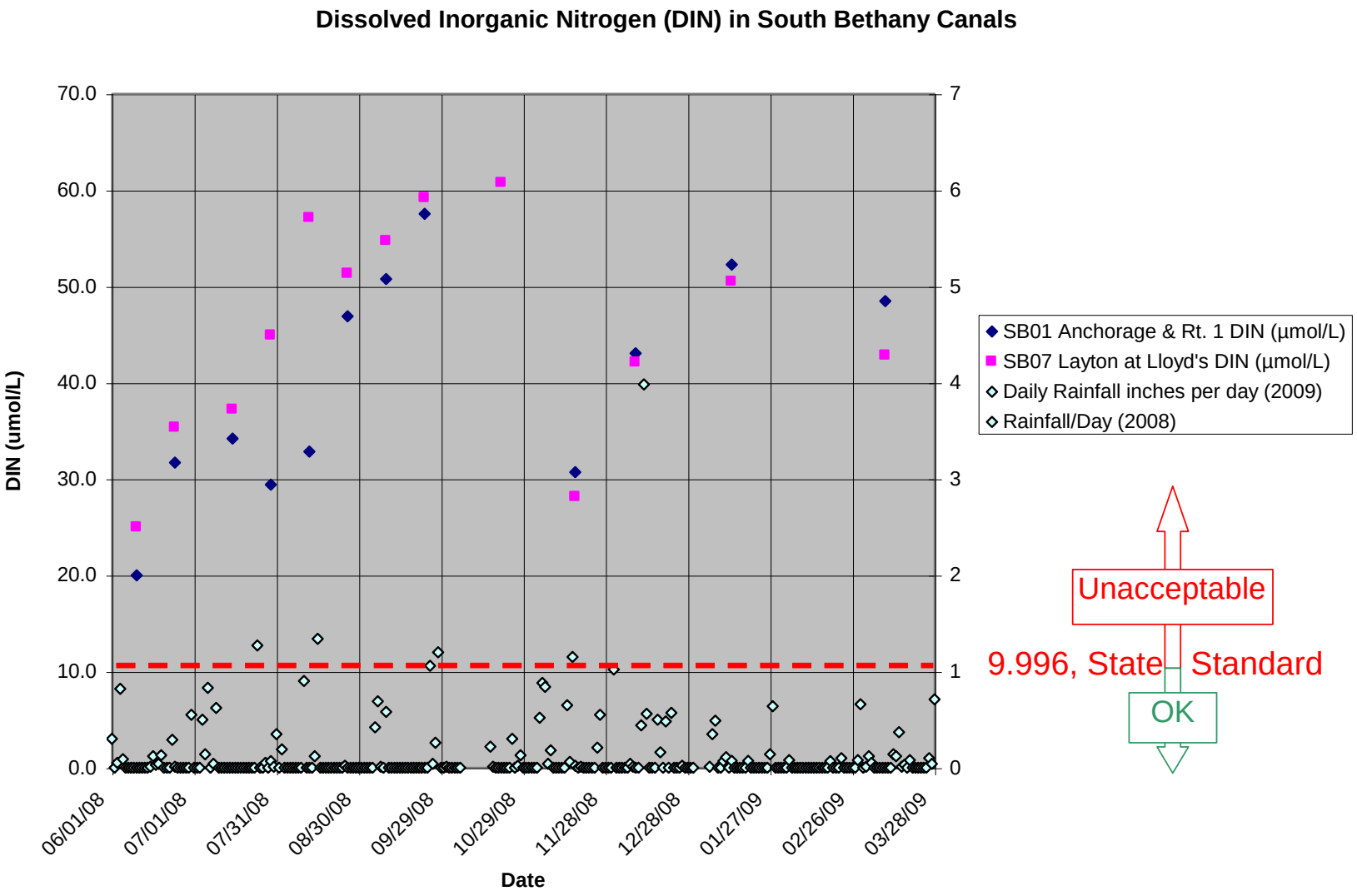
2008 Bacterial Levels in South Bethany Canals



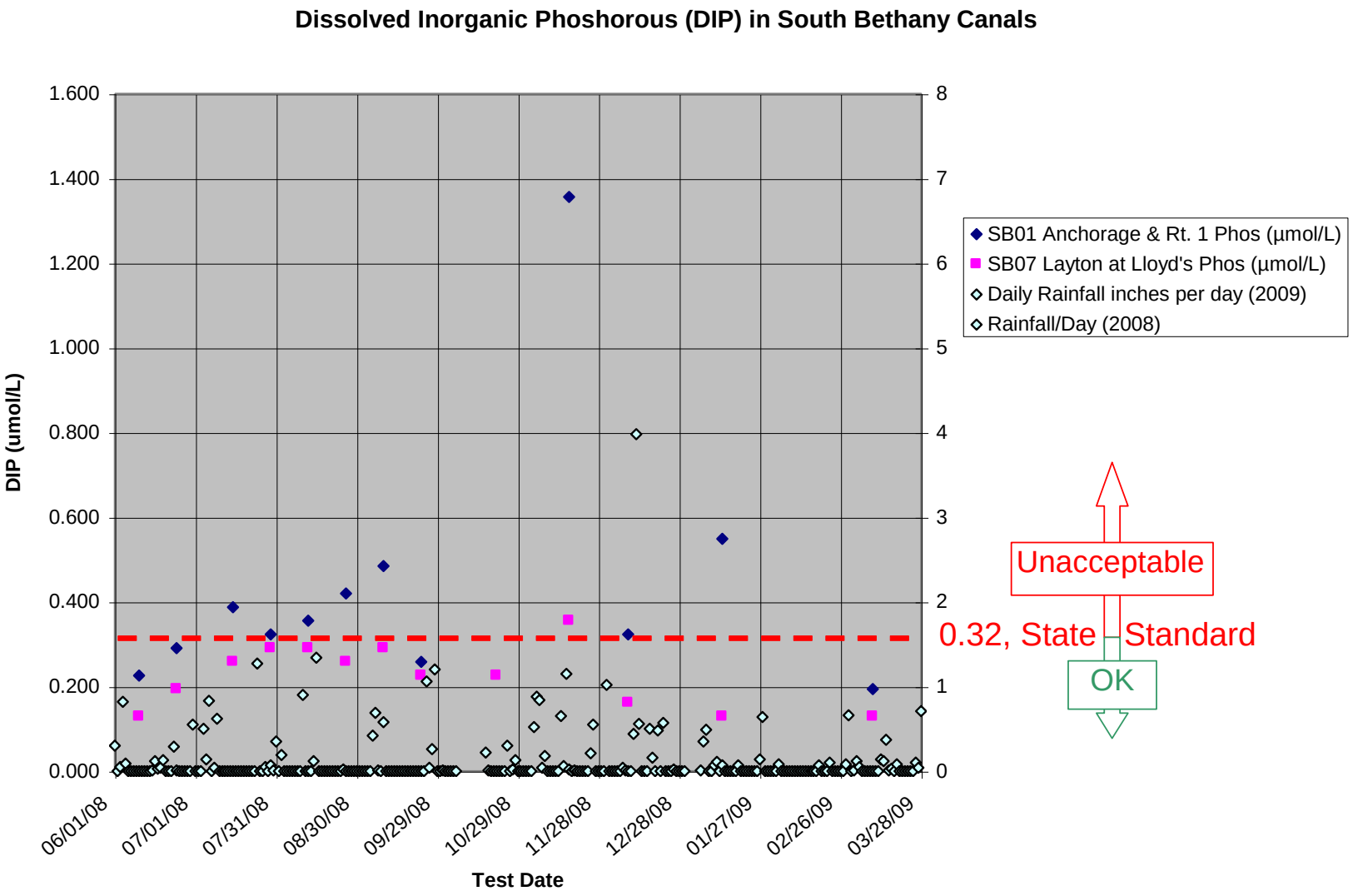
2008, 2009 Bacterial Levels in South Bethany Canals – The Further From Snap Gut – The Higher The Bacteria Levels



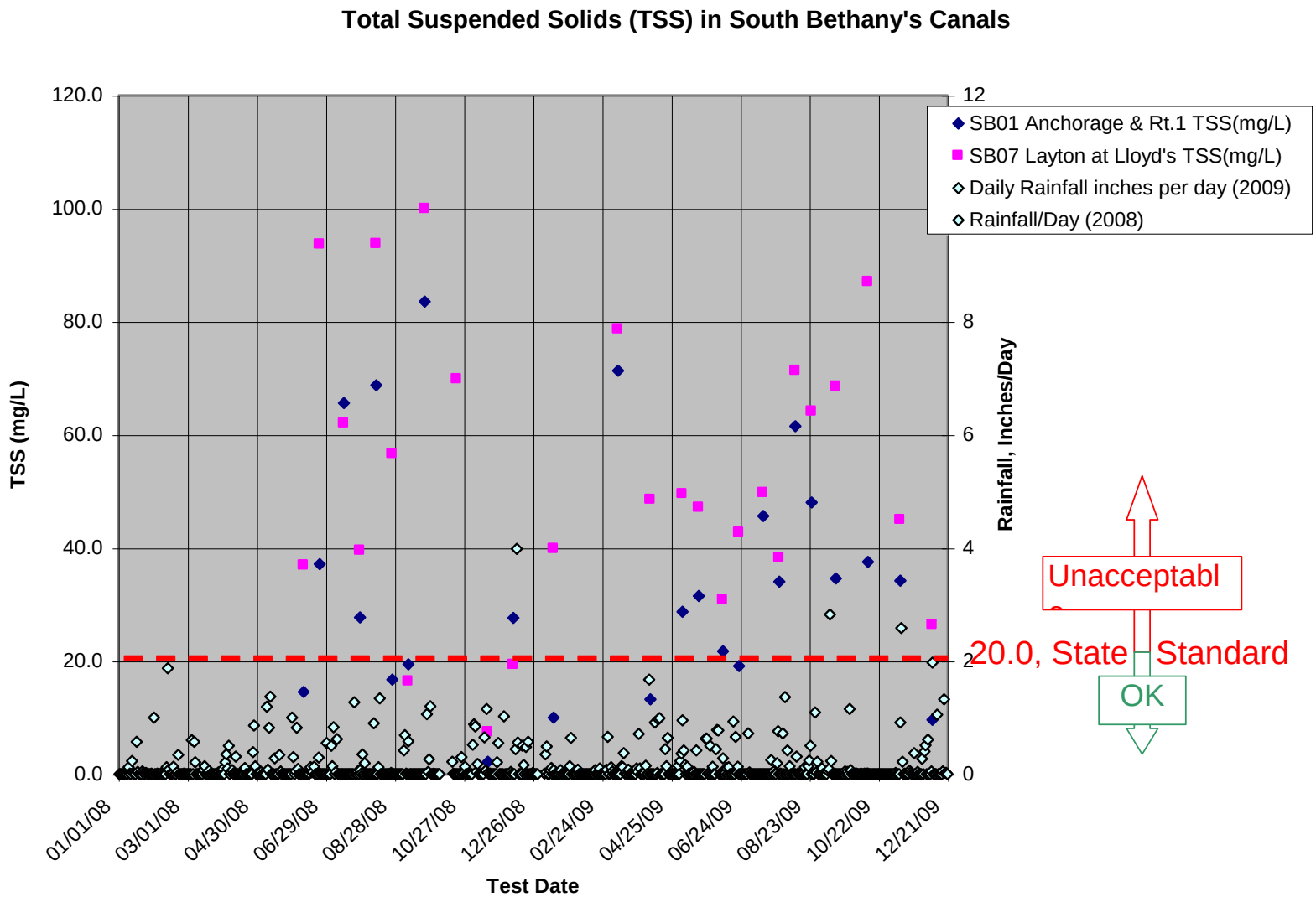
2008, 2009 Dissolved Inorganic Nitrogen Too High Everywhere



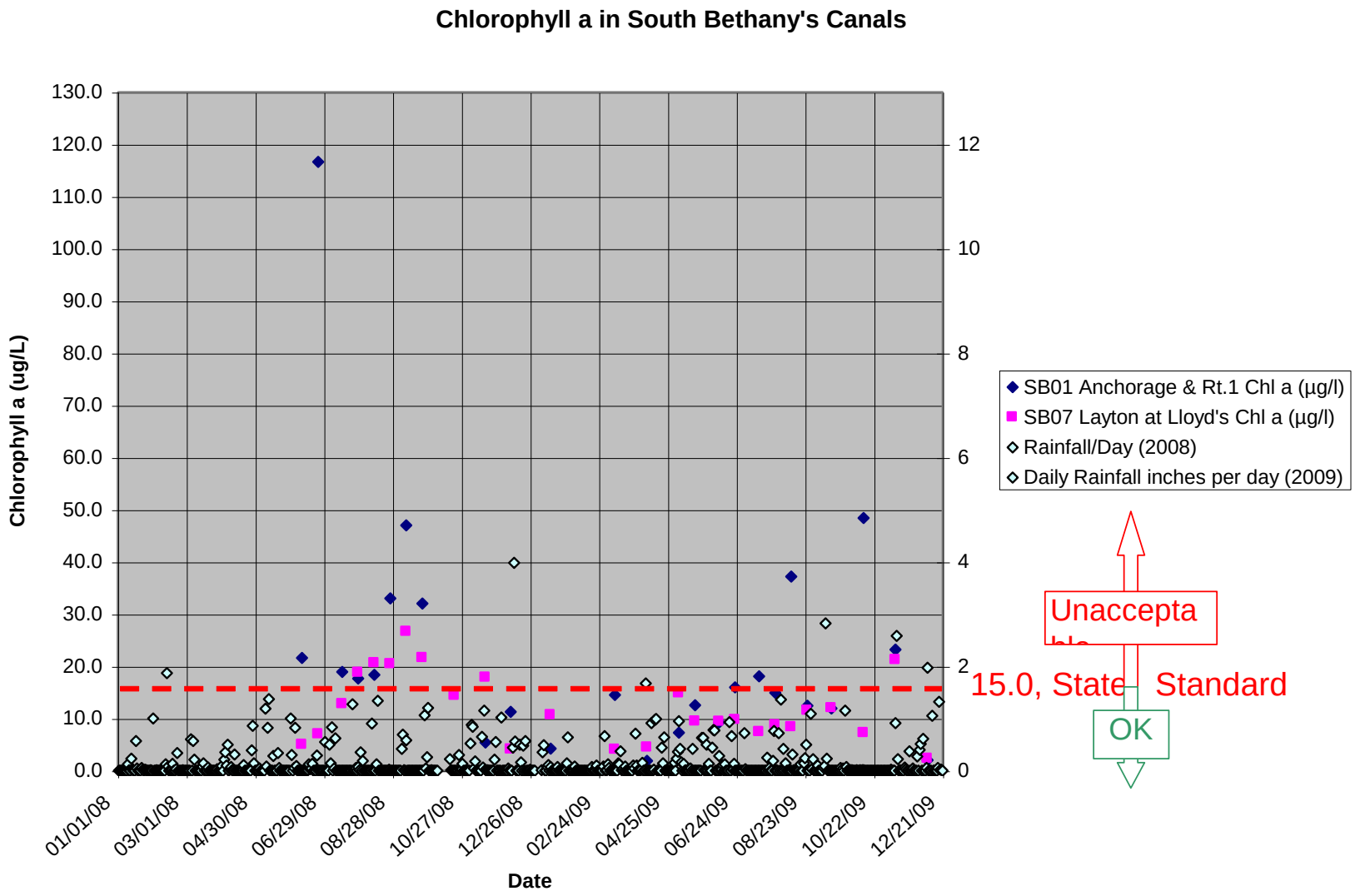
2008, 2009 Dissolved Inorganic Phosphorous Too High Away From Snap Gut



2008, 2009 Total Suspended Solids



2008, 2009 Chlorophyll a High In The Summer



What we put in our canals stays there for many months.

Pollution & Stormwater Control Strategy For The Anchorage Canal Drainage Area Report click on

http://www.inlandbays.org/cib_pm/pdfs/uploads/ACDARPdraftstrategy.pdf and http://www.inlandbays.org/cib_pm/comments.php?id=548_0_17_0_C

The Drainage Area is 125 Acres

25 Retrofits Were Suggested

- 2 In Bethany Beach
- 9 In Sea Colony
- 13 Along Coastal Highway
- 1 In The Anchorage Canal

5 Neighborhood Recommendations

I. Lawn Care Education

II. Downspout & Outdoor Shower Disconnection

III. Storm Drain Stenciling/Marking

IV. Impervious Cover Reduction

V. Inlet Retrofits

Retrofit Opportunities (1 of 3)
CIB Has A Grant For Retrofits Highlighted

Table 5. Summary of Retrofit Opportunities

Location	Retrofit ID	Proposed Practice	Drainage Area (acres)	Estimated Cost*	TN Removal (lbs/yr)	Cost / lb/yr TN Removed	% of TN TMDL Goal	TP Removal (lbs/yr)	Cost / lb/yr TP Removed	% of TP TMDL Goal
South Pennsylvania Avenue	R1a	Replace compacted gravel with pervious reinforced turf	1.00	$71,014	3.72	$19,090	1.60%	0.52	$136,565	4.00%
	R1b	Convert existing ditch to sediment forebay	14.00	$6,094	-	-		-	-	
Sea Colony	R2a	Convert existing ditch to wet swale and add filter strips								
	R2d	Add short control structure upstream of driveway culverts	31.00	$41,043	12.24	$3,353	5.20%	0.78	$52,619	6.00%
	R2b	Create sediment forebays for existing wet pond	5.00	$24,415	-	-	-	-	-	
	R2c	Install filter strip at Sea Colony promenade	1.00	$18,199	1.78	$10,224	0.80%	0.24	$75,829	1.80%
	R2e	Convert existing ditch to wet swale and construct additional curb openings								
	R2f	Add short control structure upstream of sidewalk crossings								
	R2g	Convert existing stone-lined swale to grass swale and add curb openings								

Retrofit Opportunities (2 of 3)

Table 5. Summary of Retrofit Opportunities										
Location	Retrofit ID	Proposed Practice	Drainage Area (acres)	Estimated Cost*	TN Removal (lbs/yr)	Cost / lb/yr TN Removed	% of TN TMDL Goal	TP Removal (lbs/yr)	Cost / lb/yr TP Removed	% of TP TMDL Goal
	R2i	Convert existing stone-lined swale to grass swale and add curb openings	42.50	$31,216	10.76	$2,901	4.50%	0.68	$45,906	5.20%
	R2h	Construct wet pond on land-locked parcel	41.50	$335,470	21.60	$15,531	9.10%	5.05	$66,430	38.80%
Coastal Hwy	R3	Construct Coastal Hwy median bioretention	1.01	$23,169	3.25	$7,129	1.40%	0.39	$59,408	3.00%
	R4a	Construct bioretention along right-of-way	0.84	$12,928	2.17	$5,958	0.90%	0.26	$49,723	2.00%
	R4b	Construct Coastal Hwy median bioretention	0.51	$14,203	1.57	$9,046	0.60%	0.19	$74,753	1.50%
	R4c	Cap underdrain in bioretention to promote infiltration	0.39	$100	1.85	$54	0.80%	0.22	$456	1.70%
	R5a	Construct bioretention along right-of-way	0.56	$11,322	1.56	$7,257	0.70%	0.19	$59,589	1.50%
	R5b	Construct Coastal Hwy median bioretention	0.65	$16,165	2.00	$8,083	0.80%	0.24	$67,354	1.80%
	R6a	Construct bioretention along right-of-way	1.11	$12,662	1.66	$7,627	0.70%	0.2	$63,310	1.50%
	R6b	Construct Coastal Hwy median bioretention	0.48	$13,989	1.47	$9,516	0.60%	0.18	$77,717	1.40%

Retrofit Opportunities (3 of 3)

Table 5. Summary of Retrofit Opportunities										
Location	Retrofit ID	Proposed Practice	Drainage Area (acres)	Estimated Cost*	TN Removal (lbs/yr)	Cost / lb/yr TN Removed	% of TN TMDL Goal	TP Removal (lbs/yr)	Cost / lb/yr TP Removed	% of TP TMDL Goal
	R7a	Construct bioretention along right-of-way	1.55	$10,502	1.08	$9,724	0.50%	0.13	$80,785	1.00%
	R7b	Construct Coastal Hwy median bioretention	0.58	$15,612	1.78	$8,771	0.80%	0.21	$74,343	1.60%
	R8a north	Construct bioretention along right-of-way	0.24	$8,376	0.70	$11,966	0.30%	0.08	$104,700	0.60%
	R8a south	Construct bioretention along right-of-way	0.28	$7,401	0.62	$11,937	0.30%	0.07	$105,728	0.50%
	R8b	Construct Coastal Hwy median bioretention	0.39	$12,379	1.20	$10,316	0.50%	0.14	$88,421	1.10%
Anchorage Canal Loop Section	R9	Construct wetland at canal forebay	85.00	$235,813	14.28	$16,514	6.00%	3.99	$59,101	30.70%
TOTALS				$922,072	50.10			7.27		

Neighborhood Recommendations (1 of 2)

I. **Lawn Care Education**

– Although the average grass cover on individual lots was only 10-15%, a majority was medium to highly managed. Highly managed turf is defined as lawns where fertilizers, pesticides, and irrigation appear to be used to maintain a dense grass cover, which can result in polluted stormwater runoff. Lawns that are lush, dense, and consistently green may suggest the use of fertilizers and/or herbicides, particularly if they are managed by a lawn care company. Pollutants from the lawn can be washed into storm drains from either rainfall or routine lawn watering.

II. Downspout & Outdoor Shower Disconnection

III. Storm Drain Stenciling/Marking

I. Inlets are sometimes used as a means of disposal for trash, yard waste and household products. Storm drain stenciling/marking teaches residents that what enters a storm drain eventually goes downstream, or in this case, to the Anchorage Canal. A message, such as, “Don’t dump, drains to Anchorage Canal” sends a clear message to keep trash and debris, leaf litter and organic matter out of the storm drain system.

Neighborhood Recommendations (2 of 2)

IV. Impervious Cover Reduction

V. Inlet Retrofits

- There were many inlets located in small depression areas. One potential retrofit to improve stormwater quality is to remove the pavement and rip-rap surrounding these inlets. Grass and native vegetation can then be planted around the inlets to serve as pretreatment.

CIB Has A Grant To Implement Two Of The Study Recommendations

- We are 95% completed the assessment project and are awaiting delivery of the final report and GIS layers from CWP.
- The CIB in coordination with the Town, DelDOT, Sea Colony, and UD have been awarded a grant from the DNREC Clean Water Advisory Council Community Water Quality Grants Program for two implementation projects along South Pennsylvania Avenue. The CIB has also contributed approximately $30,000 in additional funding to this project.
- At this time, these projects remain in the conceptual stage and we are searching for a consultant to study and design the projects prior to a target implementation of next Spring.

Future Funding For Retrofit Funding

- The CIB in coordination with Middlesex Beach and DelDOT has also applied for a grant from the DNREC Non Point Source Pollution Program to do a pilot retrofit on one of the highway median areas.
- If successful, we would be granted the award around July of 2011.
- Finally, I think it would be best to call a meeting with the partners to discuss a more focused funding strategy. We have been successful picking up good piecemeal funding to jumpstart the effort, but a large sum would gain an enormous amount of efficiency and $aving$.

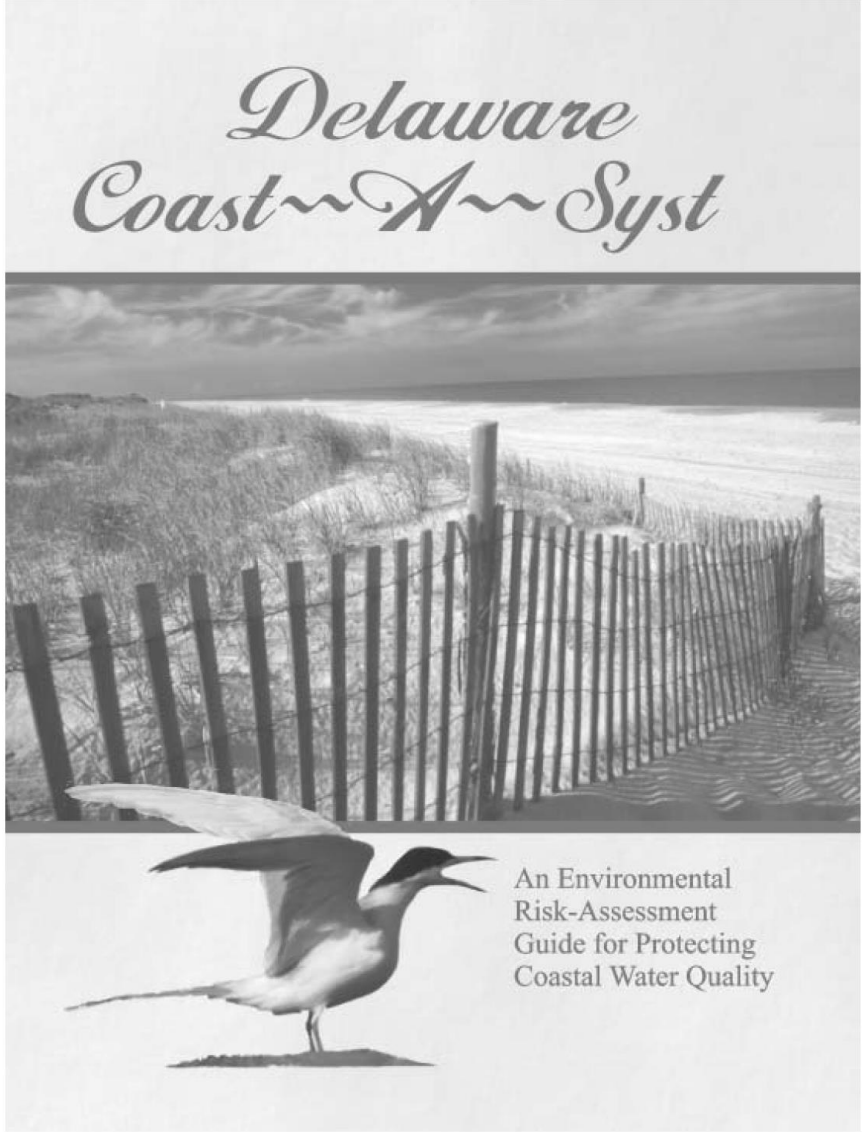
Part Of The Forebay Was Cleaned Out By DelDOT In April 2010. Allot Of Sediment Was Removed, However The Forebay Is At Best Only 28% Efficient.

Educational Opportunities

– Storm Drain Stenciling/Marking	Gene Hendrix
– Rain Gardens	George Junkin
– Delaware Coast – A – Syst	
– Lawn Care	Al Rae
– Rooftop Downspout Disconnection Education	Andy Ross
– Outside Shower Disconnection Education	Andy Ross
– Impervious Surface Reduction Education	Al Rae
– Rain Barrels	

Rain Gardens Are A Good Way To Keep Polluted Water From Getting Into Our Canals. Sandi Robert's Is An Excellent Example click on http://www.inlandbays.org/cib_pm/outreach.php

Delaware Coast – A - Syst



Delaware Coast ~A~Syst, An Environmental Risk Assessment Guide For Protecting Coastal Water Quality

Prepared by Delaware Coastal Programs, Division of Soil and Water Conservation, DNREC.

This document contains valuable information that can be used by homeowners to protect and improve the quality of water in our canals.

Pertinent chapters are:

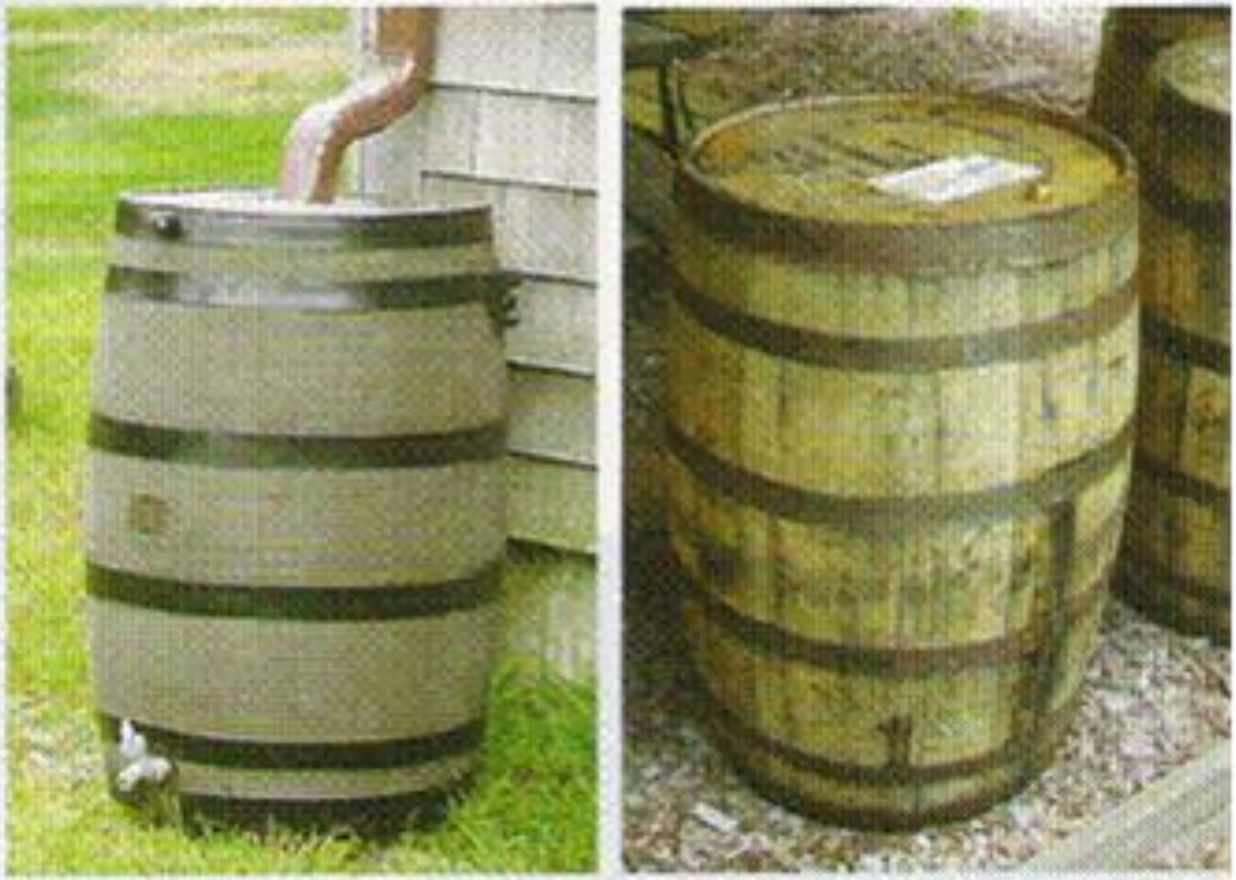
–2. Managing Stormwater on your property

–5. Managing Hazardous Household Products

–6. Home Landscaping Management

–7. Caring For Your Boat & Dock

Rain Barrels



Rainbarrels are available in various sizes and are made of plastic or from wood barrels. A plastic rainbarrel in 30-60 gallon capacity with downspout kit cost about $100-$250 range. Wooden rainbarrels are $200-300. Or, you can make one yourself. Directions are available online.

Dave Wilson Leads a Crew of Citizen Monitors; Bryant Hopkins, Dick Oliver, Sue Callaway, Glenn Dallas, Gary Stoll

Al Allenspach Lead Our Oyster Gardening Project At Over 32 Sites In South Bethany

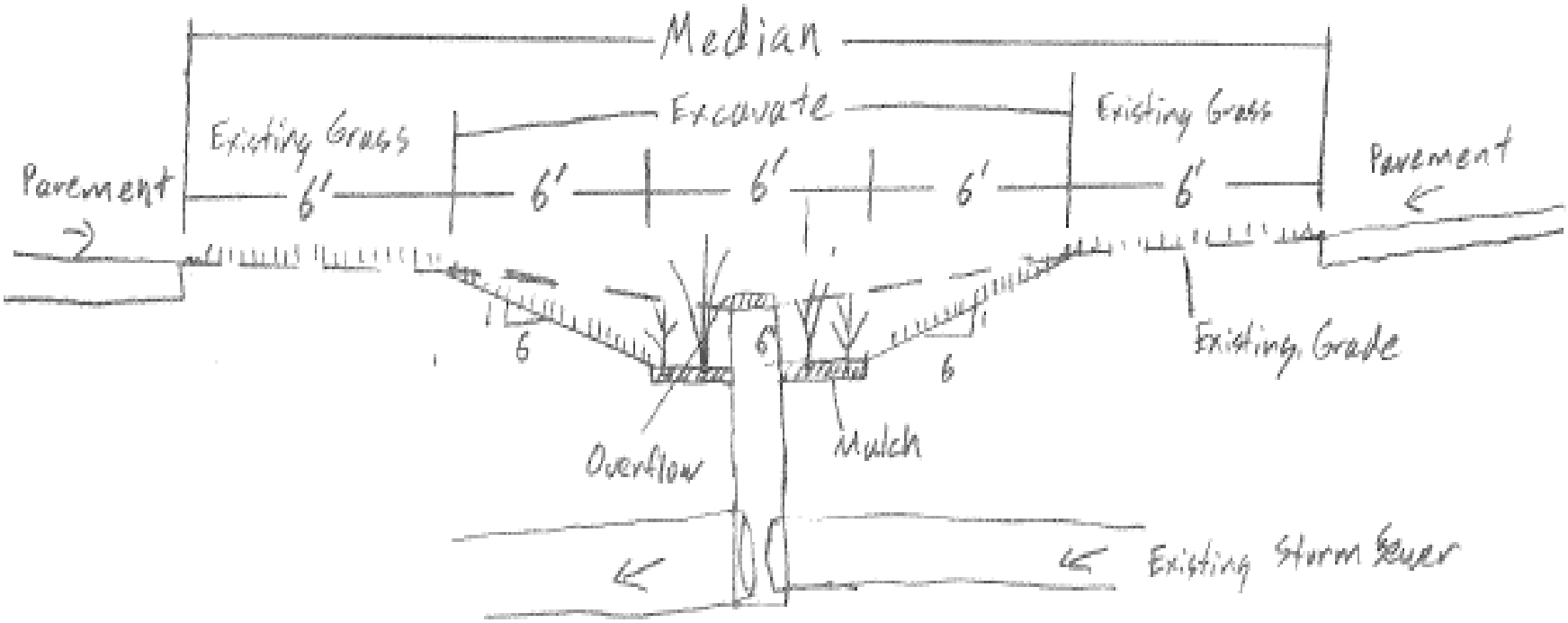
Review And Discussions Of Potential Retrofits

- Inlet Retrofits Sue, George and John Speer
  - Filters from DelDOT
  - Filtrexx® Treatment Train [~$300/(catch basin)]
  - CWP Approach – Inlet Retrofits Discussed Above
- Rt. 1 Median Bioretention ($15k to $30k)/each Sue & George
- Rt. 1 East Side Bioretention ($7k to $15k)/each Sue & George
- Rt. 1 West Side Bioretention ($7k to $15k)/eachSue & George
- Diffuser System [$20k to $25k/(1,600ft)]
- Tidal Pump System (~$7m)
- Anchorage Forebay/Wetland Jay Headman

Filters Received From DelDOT

The Filtrexx® Treatment Train

Rt. 1 Median Bioretention Retrofit
East & West Side Bioretention Is Similar

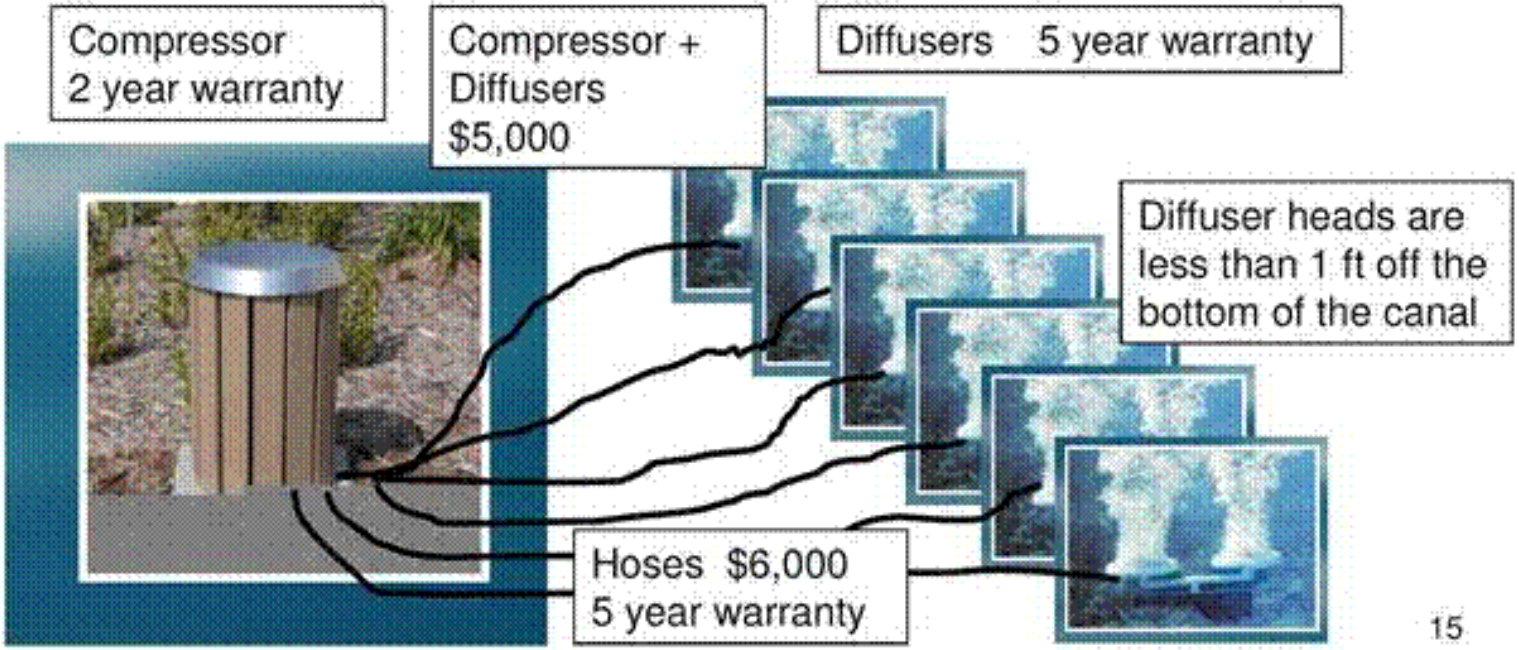


Cross Section A-A'

Todd Fritchman From Envirotech Has Given Us A Price For A Diffuser System

Cost For Diffusers For One 1,600 ft Canal
<$15,000 For Installation
~$750 Electrical Cost for 5 Months

- One compressor, no larger than a trash can, located at the RT 1 end of a canal, like the Petherton Canal, can supply compressed air through weighted tubing to 6, equally spaced, diffusers along the 1,600 foot length of the canal.



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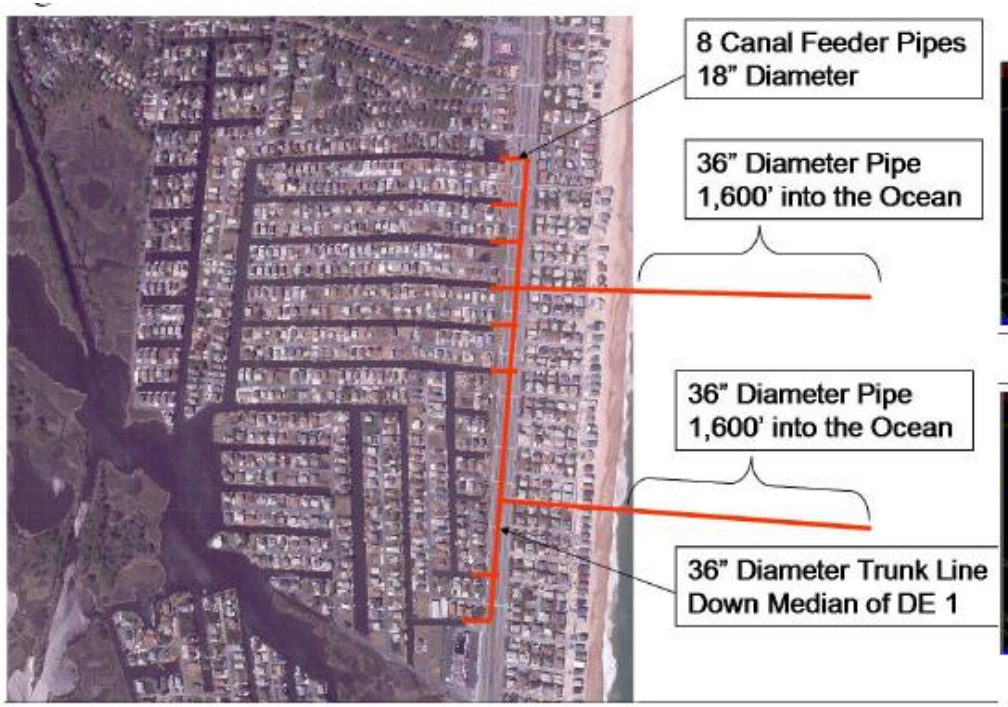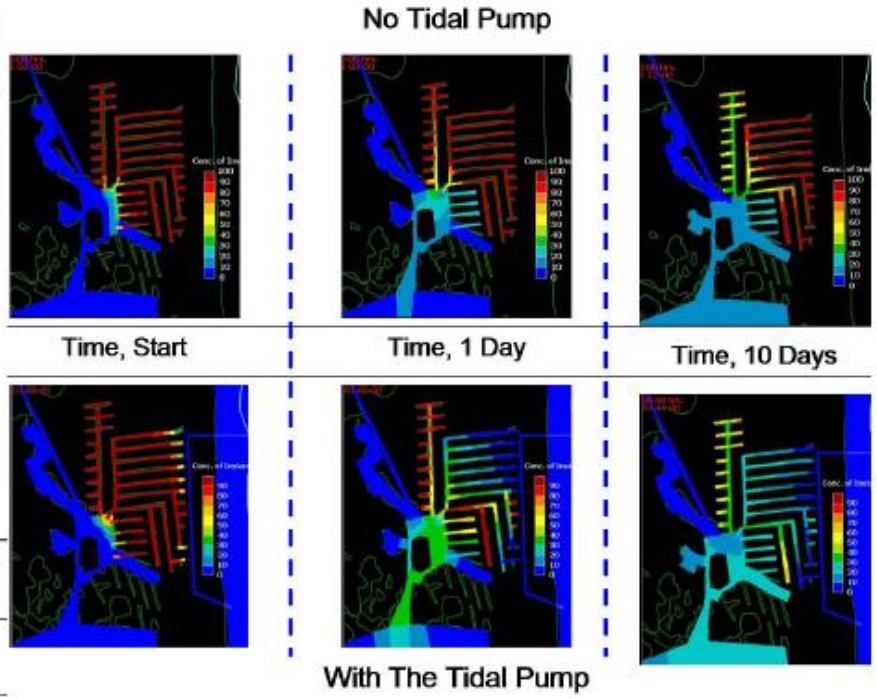
The Tidal Pump System Developed By Lloyd Hughes