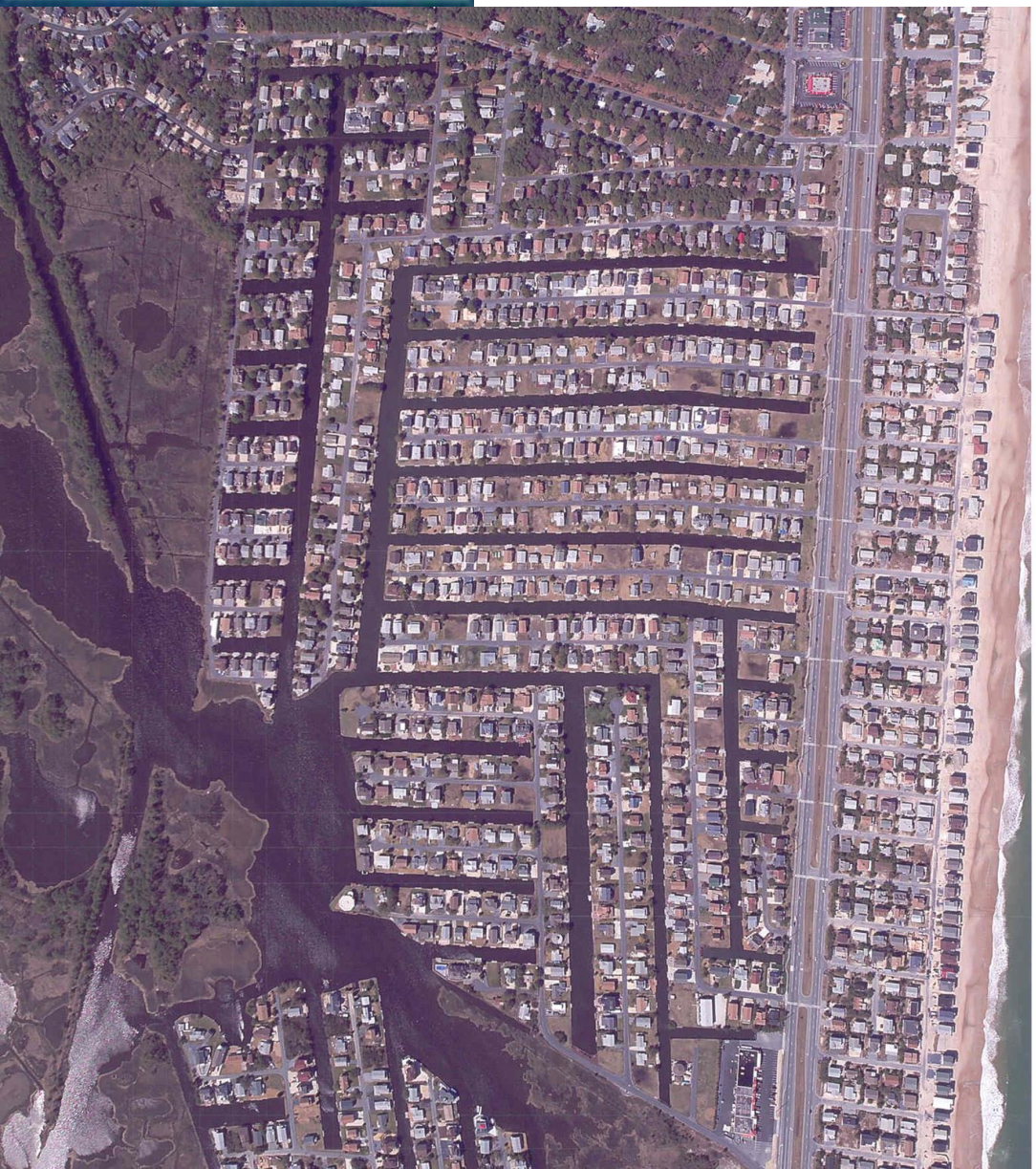


TOWN OF SOUTH BETHANY

Canal Water Quality Presentation

Thursday, Aug. 27, 2009

at the
Council Work Shop
Meeting

Canal Water Quality Presentation
Purpose (Provide Status) and Agenda

1. Introduction, Welcome and Purpose of Meeting	Jay
2. Goal of South Bethany Water Quality Committee	Jay
3. History of Monitoring Studies	George
4. South Bethany Actions to Improve Water Quality	
• Water Quality Monitoring (Dave Wilson)	Jay
• Oyster Gardening (Alan Allenspach)	Jay
• Education (George and Jay)	Jay
• Diffusers (George Junkin)	George
5. Anchorage Canal Drainage Area Assessment Project	Jay

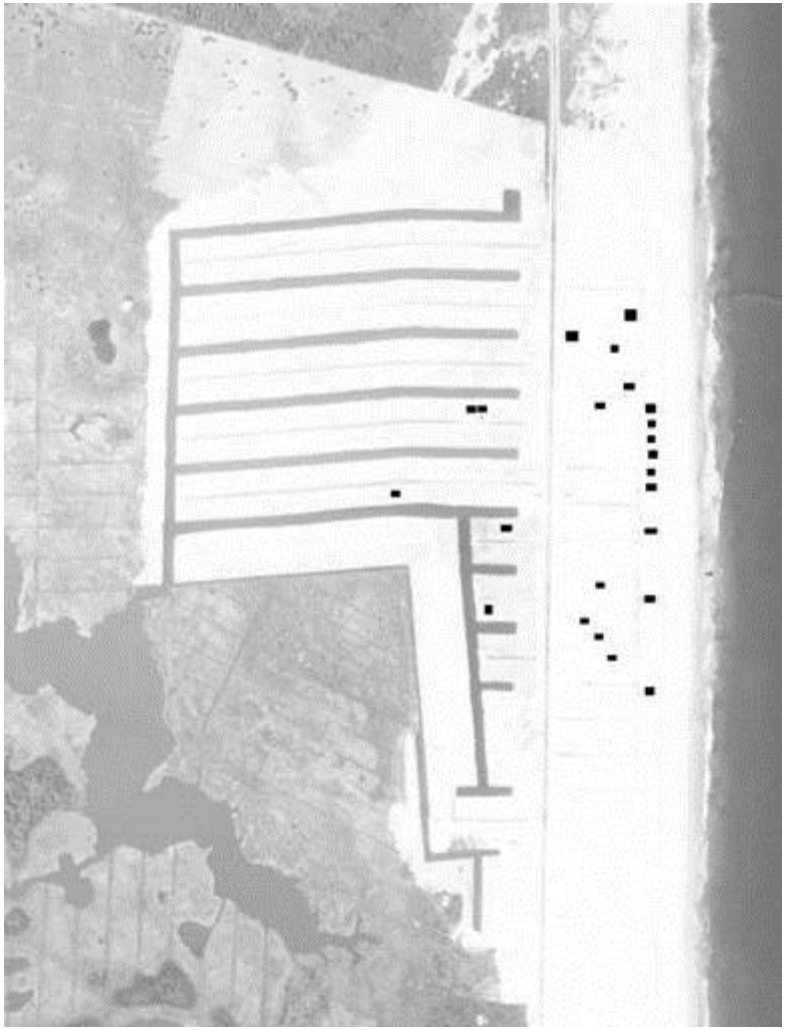
Members of the South Bethany Canal Water Quality Committee

- Jay Headman
- Allan Allenspach
- Gene Hendrix
- Lloyd Hughes
- Gary Jayne
- George Junkin
- Al Rae
- Dave Wilson

The Goal of The South Bethany Water Quality Committee Is To Make Our Canals “Fishable & Swimmable”

- In order to accomplish this goal the committee will:
  - Educate the community on canal water quality issues and provide them with strategies that can be used to help clean up the canals.
  - Work with the Town, State, and Federal Government to eliminate pollutants entering our canals.
  - Review current Town Ordinances and, if necessary, create new ones that would eliminate pollutants entering our canals.
  - Work closely with the Center for the Inland Bays (CIB).

History of Monitoring Studies Shows That Increased Population Density Is Decreasing The Quality Of The Water In Our Canals



In July 1954 South Bethany Canals Were Fishable and Swimmable

Development Has Reduced The Water Quality In South Bethany Canals

1996 Lagoon Water Quality/Rainfall Study

by Jack Pingree, Division of Water Resources, DNREC

Water Quality (Enterococcus Level) was measured 34 times between April 22, 1996 and August 28, 1996 at 4 sites.
Swimming standard at the time was 156 cfu/100ml

1.Anchorage & Rt. 1

Exceeded standard 20 times

Maximum measured 3,000 cfu/100ml

2.Anchorage & O'Connor home

Exceeded standard 11 times

Maximum measured 3,000 cfu/100ml

3.Petherton & Rt. 1

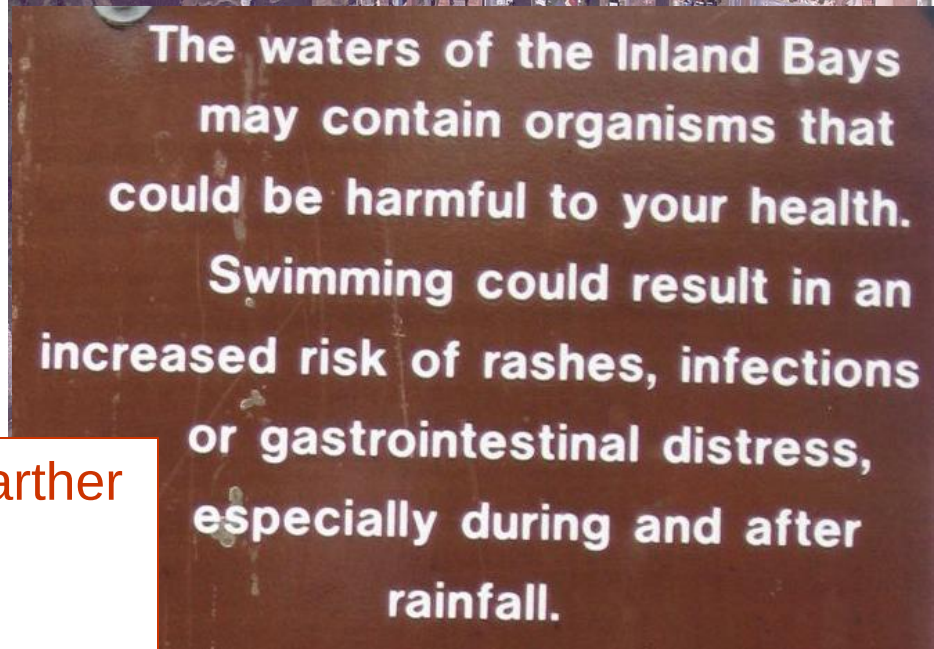
Exceeded standard 20 times

Maximum measured 2,200 cfu/100ml

4.Anchorage & Petherton

Exceeded standard 7 times

Maximum measured 2,166 cfu/100ml



The inland bays are questionable. The farther removed from the inland bays we are the poorer the quality of water.

January 2001 CIB Report Characterized Storm Water Discharge Into The Anchorage Canal

- The study report documents that for each rainfall of about ½ inch during 1998 and 1999
  - About 360,000 gallons of stormwater were dumped into the Anchorage Canal.
  - During each event this stormwater contained
    - 6 pounds of Nitrogen
    - ½ pound of Phosphorous
    - 90 pounds of Chemical Oxygen Demand (COD) material
    - 10,000 to 100,000 colony forming units of fecal coliforms per 100ml of stormwater

Stormwater runoff is bad for our canals.

In Early 2004 DelDOT Installed the Current Sediment Control Forebay at the Easterly End of the Anchorage Canal To Reduce The Pollution That Enters Our Canals.

Due To Size Constraints This Forebay Is Only 28% Efficient.

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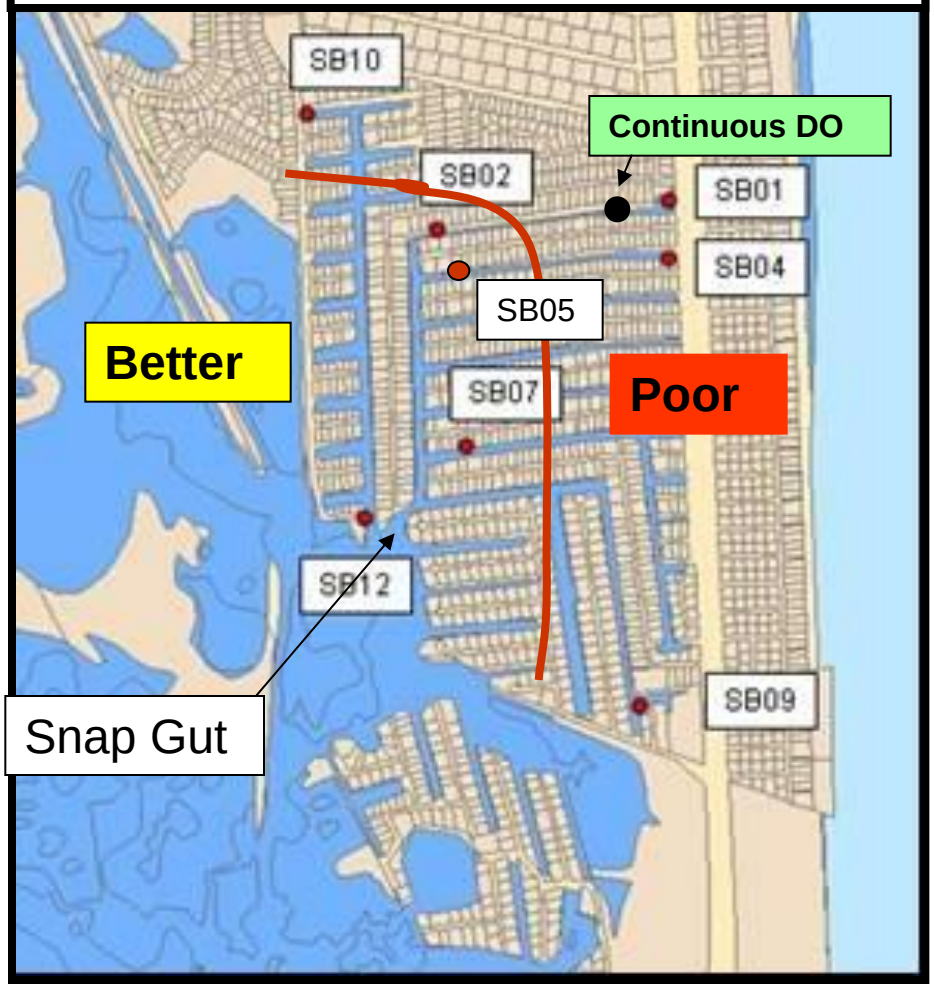
Dave Wilson is Leading a Group to Monitor Water Quality in the South Bethany Canals

Testing Locations



Quantities to be monitored:

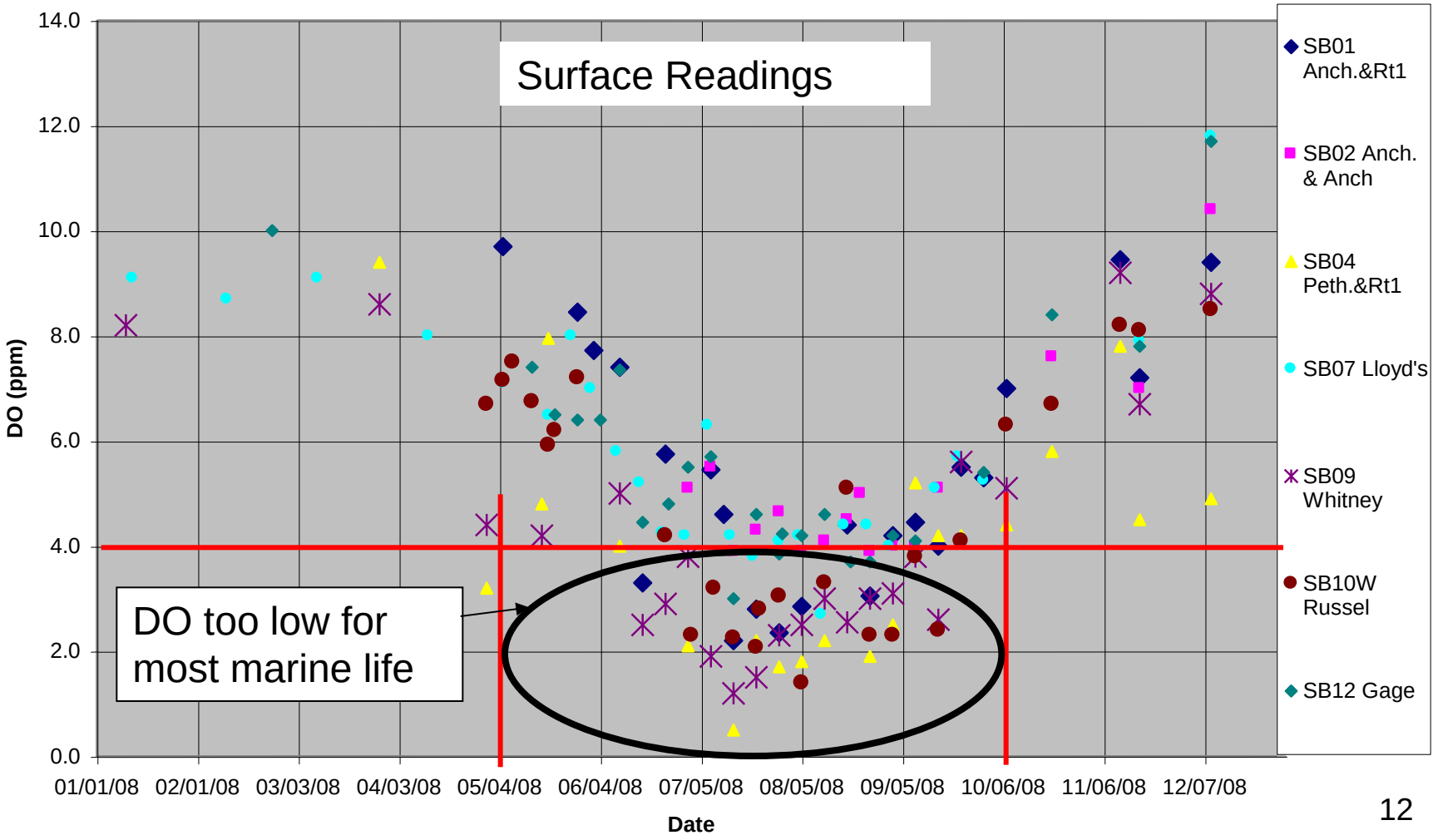
- For "Fishable" Waters
  - Dissolved Oxygen
  - Water Temperature
  - Salinity
  - Nitrogen and Phosphorus
  - Secchi Depth
- For "Swimmable" Waters
  - Bacteria
- Storm Water Influence
  - Collect accurate local rain data

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

Six Volunteers Monitor The South Bethany Canals

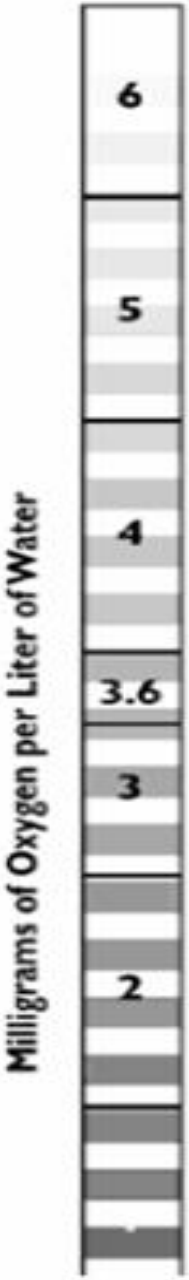
- Bryant Hopkins
- Dick Oliver
- Sue Callaway
- Glenn Dallas
- Gary Stoll
- Dave Wilson

Summary of 2008 DO Levels in South Bethany Canals – Very Low DO Between May and October At Locations Far From Snap Gut



Welcome to
SOUTH BETHANY

Dissolved Oxygen Criteria



Milligrams of Oxygen per Liter of Water

Minimum Amount of Oxygen mg/l of Water Needed to Survive by Species

Striped Bass: 5–6

American Shad: 5

White Perch: 5

Yellow Perch: 5

Hard Clam: 5

Alewife Juveniles & Adults: 3.6
Alewife Eggs & Larvae: 5

Blue Crab: 3

Bay Anchovy: 3

Spot: 2

Worms: 1

Summary of 2008 Bacterial Levels in South Bethany Canals
Petherton Was The Worst In 2008

	2008	Geomean TE limit = 35 MPN/100ml			
	Site ID	Geomean TE	# TE samples >104.	# TE samples total	% of TE samples > 104.
Anchorage & Rt 1	SB01	29	1	9	11
Anch. & S. Anch.	SB02	14	1	9	11
Petherton & Rt 1	SB04	83	5	12	42
Layton	SB07	20	2	12	17
Boone	SB09	18	1	11	9
Russell	SB10W	13	1	12	8
Snap Gut	SB12	15	0	7	0

Al Allenspach, a Member of The SBPOA, is Leading Over 30 SBPOA Oyster Gardeners Managing 110 floats

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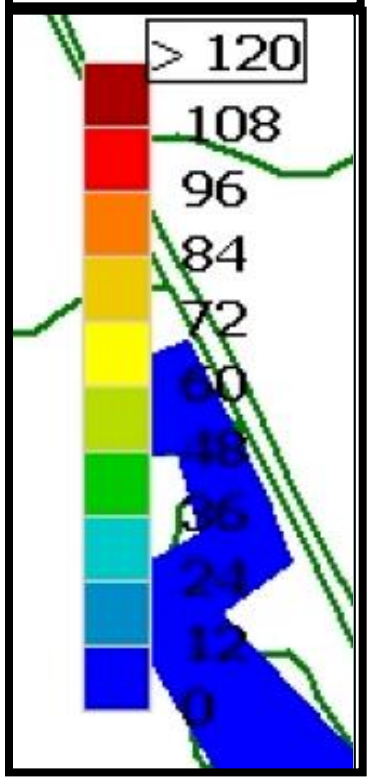
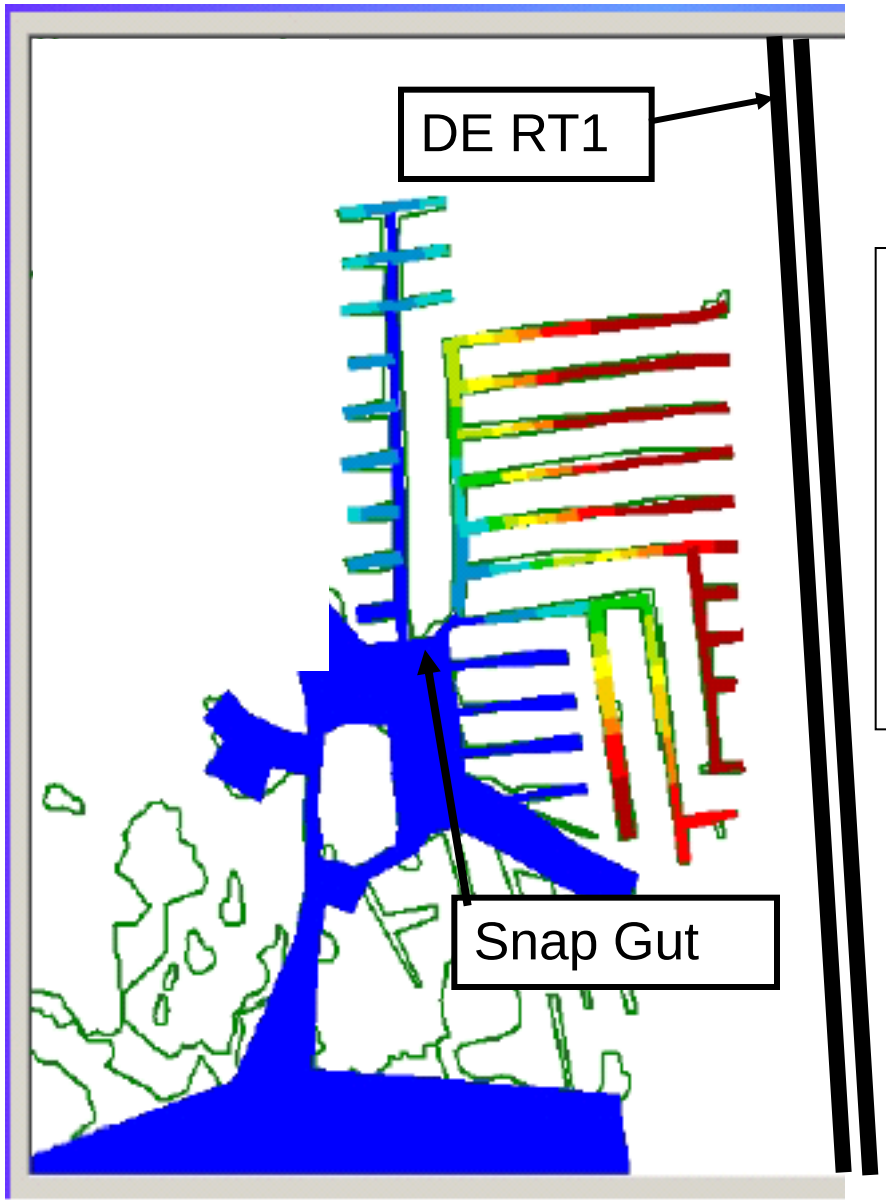
South Bethany Canals Flushing Study – *Entrix 2005* – Shows That There Is Essentially No Flushing In The Canals Far From Snap Gut.

Residence Times in Days





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

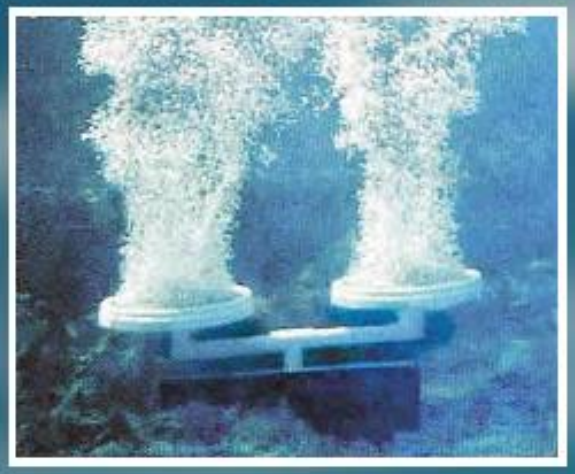
The Dead Ends Of The South Bethany Canals Act Like Stormwater Management Ponds

- Entrix Study shows where there is no circulation.
- Water quality samplings show that in the summer there is very low DO.
- The canals are in fact stormwater management ponds with no features, like aeration, that other stormwater management ponds have.
- The Entrix Analysis and the water quality samples show where action is needed.

What Actions Are Feasible?

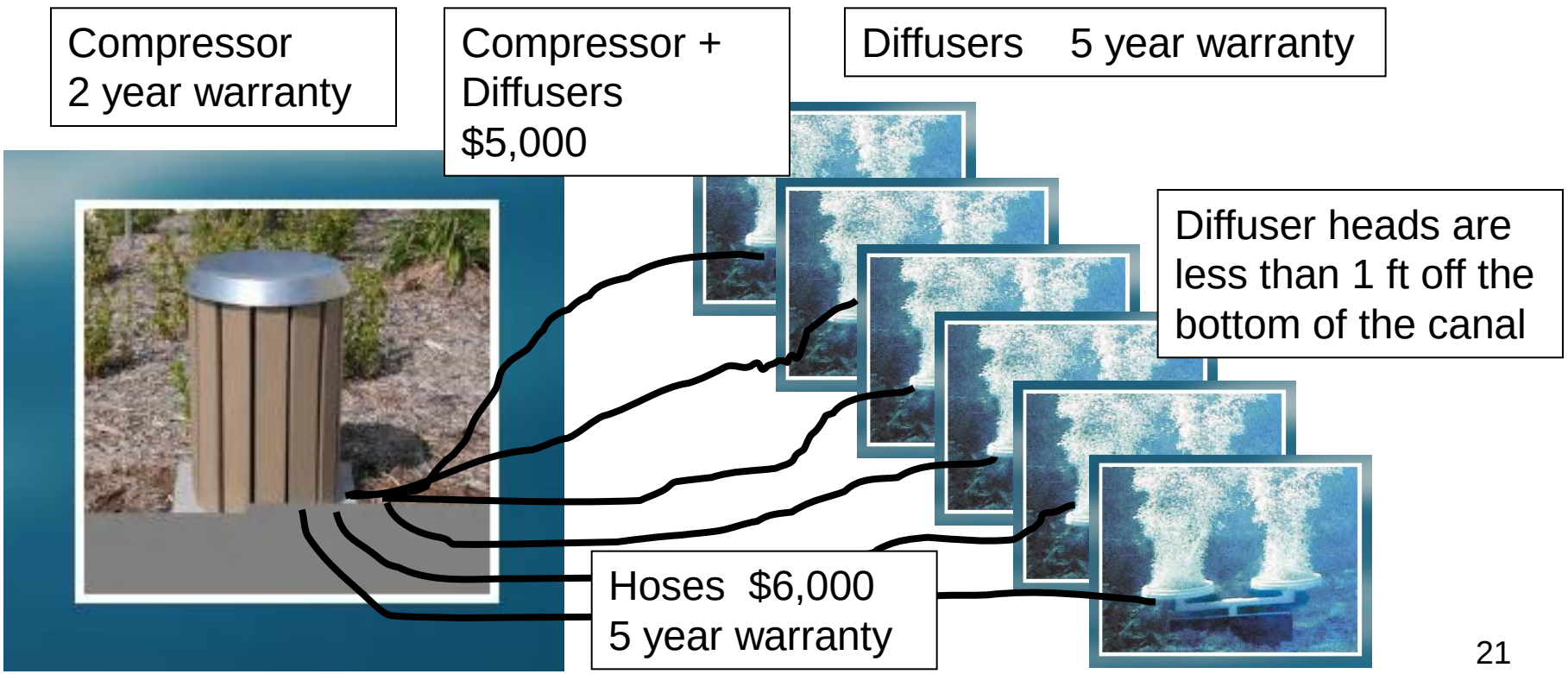
- In the past we have looked at aerators and the Tidal Pump as potential solutions to this issue.
  - The aerators tested in 2000-2002 were 3 horsepower water jets. Each only slightly affected about 600 linear feet of the canal. They eliminated stratification but they did not increase DO since they where horizontal and did not shoot up into the air.
  - The Tidal Pump has had little support from DNREC probably due to its initial price of around $5 M and annual maintenance costs of about $20,000.
- Jay and George met Todd Fritchman from Envirotech at the *Frontiers in Nutrient Management Conference* held in Rehoboth Beach in January 2009. We explained our issues to him and he told us he would give us a ROM estimate for potential solutions at no cost to us. One of his suggestions, an air diffuser system, follows.

Air Diffusion 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.



Surface Versus Diffuser Aeration

Advantages

Surface

1. Attractive sights & sounds
2. Ripples water surface
3. Mixes water in upper 4-8 feet to improve water quality in the upper zone.

Diffuser

1. Safe, no electricity in the water
2. Most energy efficient and effective
3. Mixes water in entire pond
4. Moves large volumes of water 50,000-80,000 GPH/horsepower
5. Reduces some nutrients used by most algae
6. Oxygenates entire pond. Allows aerobic bacteria to quickly decompose bottom muck
7. Improves overall pond health and allows for a natural balance to return
8. Decomposers can live in the deepest area of the pond

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Anchorage Canal Drainage Area Assessment Project - Objectives

- Assemble the most relevant information and expertise on the drainage area

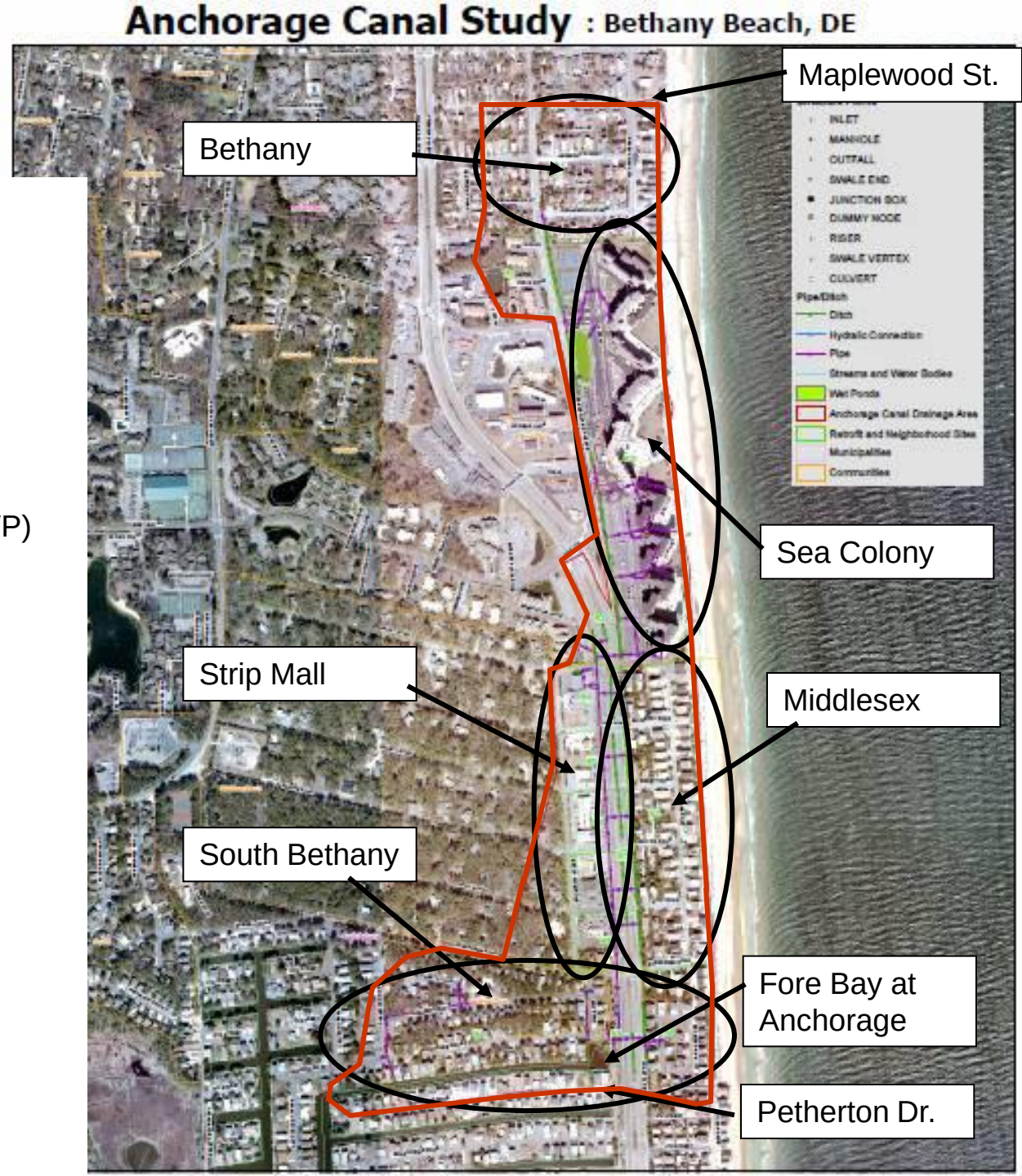
- Identify, prioritize, and conceptually develop pollution control measures with a focus on “low-impact development” or “green” storm water management techniques,

- Create a step-by-step strategy for implementing the pollution control measures, including identification of funding sources, to contribute to water quality improvement in the canals and Bay.

This project is funded by a $35,000 grant from the US Army Corps of Engineers, matched with $32,000 from the DelDOT and $3,000 from the CIB for services.

Participants:

- Town of South Bethany
  - Melvin Cusick
  - Jay Headman
  - George Junkin
- Center for the Inland Bays (CIB)
  - Chris Bason
  - Ron Wuslich
- Center for Watershed Protection (CWP)
  - Lisa Farley-McNeal
  - Greg Hoffman
- Johnson, Mirmiran & Johnson (JMT)
  - Larry Trout
- KCI Technologies
  - Matt Ostynsky
- DelDot
  - Marianne Walch
- University of Delaware
  - Susan Barton
- Sea Colony
  - Patrick Davis
  - John Gilbert
- Middlesex Beach
  - Dave Wieking



Anchorage Canal Drainage Area Assessment Project - Tasks

Task 1 – Select participants	Completed 2/2009
Task 2 – Define roles and responsibilities	Completed 3/2009
Task 3 – Storm drain inventory by KCI	Completed 6/2009
Task 4 – Project Organizational Meeting	Completed 5/2009
Task 5 – Office Assessment	Completed 7/2009
Task 6 – Field Evaluation	Completed 8/19/2009
Task 7 – Develop first draft of strategy	Scheduled 10/2009
Task 8 – Strategy Meeting	Scheduled 11/2009

Task 10 – Final Presentation to wider publics in the coastal corridor

Task 10 is scheduled for completion in December 2009, but the presentation will likely not be until the late spring or early summer so that there is more participation from the public.

Summary

- Goal is to make South Bethany canals “Fishable and Swimmable”
- In order to accomplish this:
  - Continue to reduce the pollutants that are entering South Bethany Canals.
  - Introduce retrofit strategies (i. e. diffusers, bioretention, rain gardens, and others that result from the Anchorage Study) that will improve the quality of water in our canals.
  - Provide information to our community on ways that they can help improve the quality of water in our canals.
  - Work with the CIB and local government agencies to ensure we are using best management practices for controlling pollutants. Examples are the Anchorage Canal Drainage Assessment Study, Water Quality Monitoring, Oyster Gardening.