Cape Cod 208 Area Water Quality Planning
Cape Cod Bay Watershed Working Group
Second Meeting

Cape Cod Commission Office
3225 Main St, Barnstable, MA 02630
November 5, 2013
8:30 a.m.-12:30 p.m.

Agenda

8:30 Welcome, Review 208 goals and Process and the Goals of today's meeting – *Cape Cod Commission*

8:40 Introductions, Agenda Overview, Updates and Action Items– *Facilitator and Working Group*

9:00 Range of Possible Solutions – *Cape Cod Commission and Working Group*
- Technology Matrix
- Technologies Overview
- Survey Questions and Comments
- Additional Questions and Discussion

10:30 Break

10:45 Problem Solving Process and Principles – *Cape Cod Commission and Working Group*
- Overview of 7-steps for Problem-Solving Process
- Examination of Categories of Solutions and their impacts on the Environment, Economy, and Community (triple bottom line)
- Discussion – Identify Considerations and Priorities for Application

12:00 Preparing for Meeting 3 and Beyond – *Cape Cod Commission*
- Review Tools, Alternatives Analysis Approach
- Evaluating Scenarios for Meeting Nitrogen Goals
- Other Process Next Steps

12:15 Public Comments

12:30 Adjourn

Cape Cod Bay Group

Technologies and Approaches

What is the stakeholder process?

Public Meetings

Watershed Working Groups

Goals, Work Plan & Roles

Affordability, Financing

Baseline Conditions

Technology Options Review

Watershed Scenarios

July

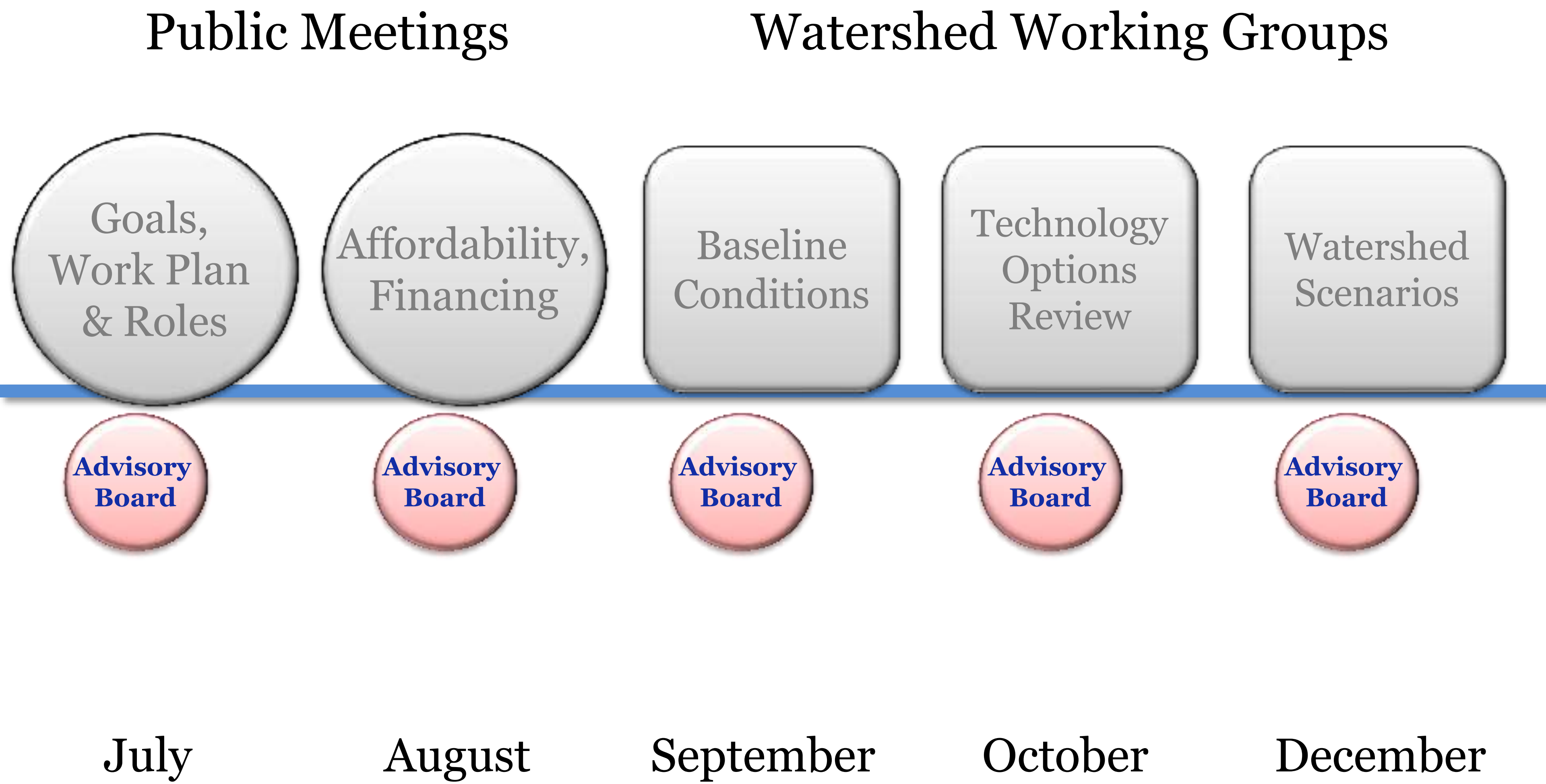
August

September

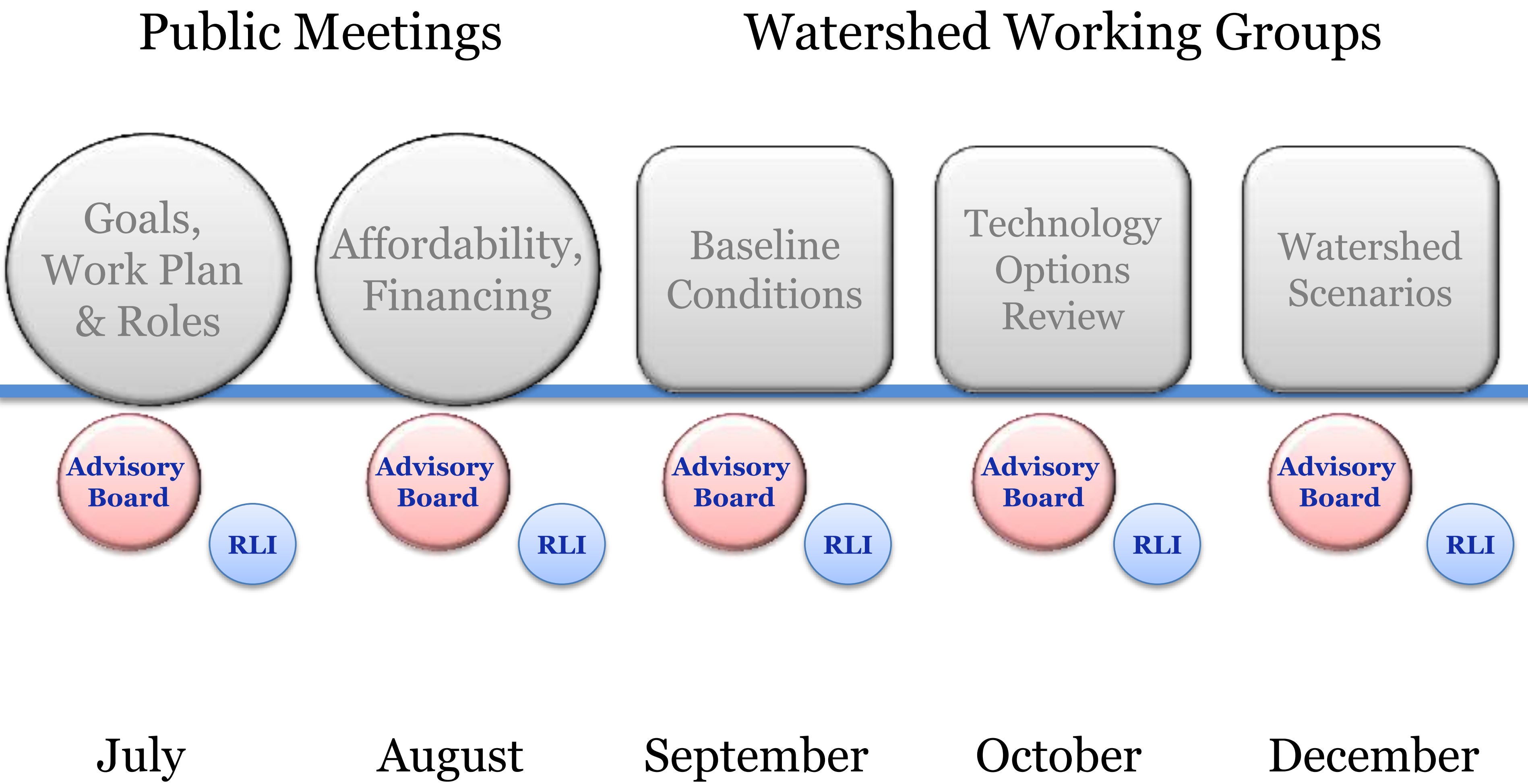
October

December

208 Planning Process



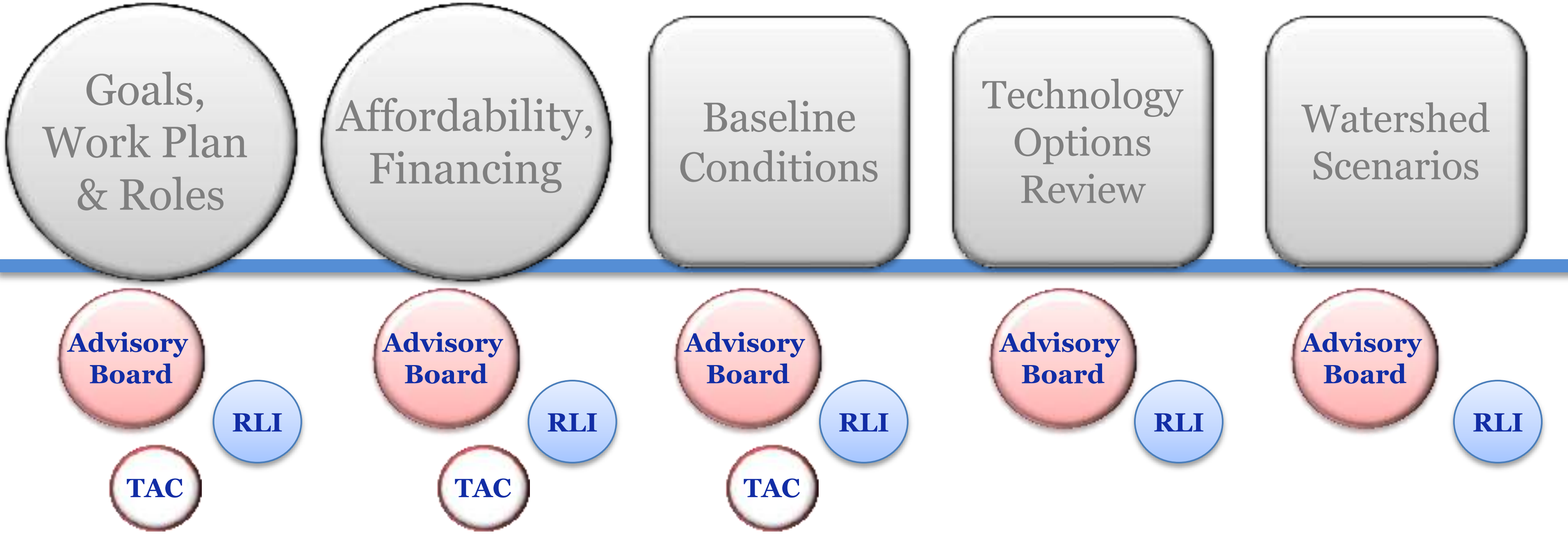
208 Planning Process



RLI Regulatory, Legal & Institutional Work Group

208 Planning Process

Public Meetings   Watershed Working Groups



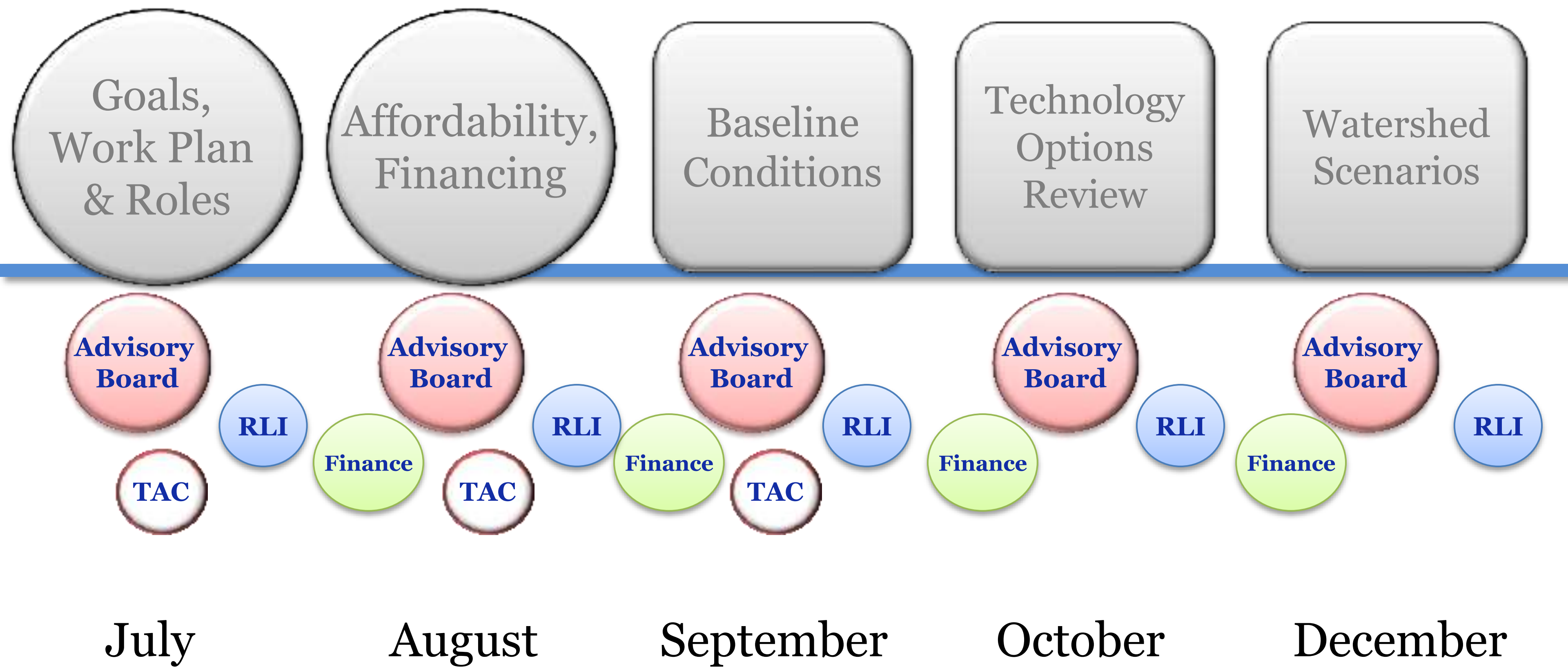
July   August   September   October   December

RLI — Regulatory, Legal & Institutional Work Group

TAC — Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process

Public Meetings | Watershed Working Groups



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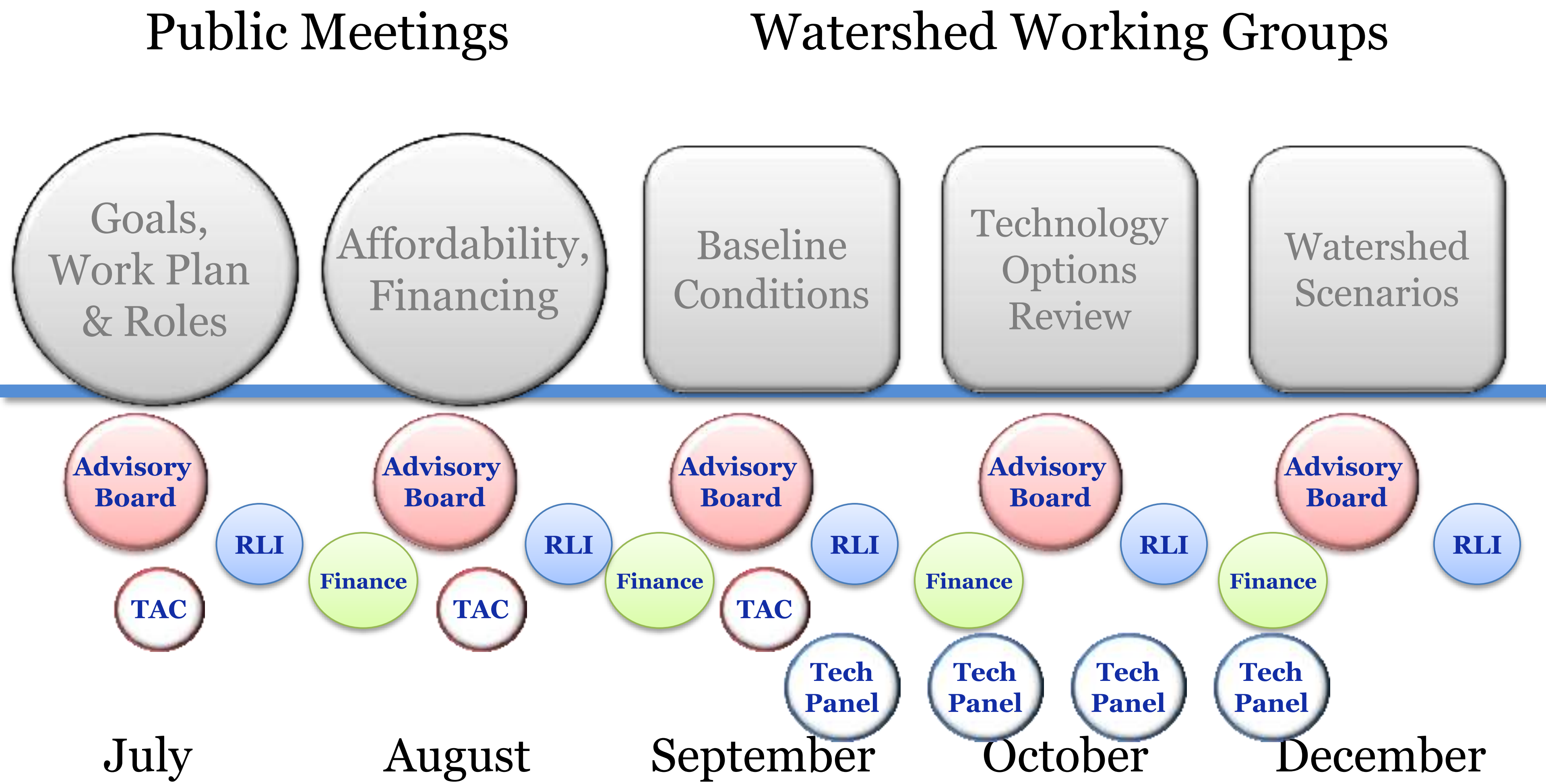

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208 Planning Process

Baseline Conditions

11 Working Group Meetings: Sept 18-27

Goal of the First Meeting:

To review and develop shared understanding of the characteristics of these watersheds, the work done to date, existing data and information available, and how to apply all of this to planning for water quality improvements for these watersheds moving forward.

Progress since last meeting

- Meeting materials

Progress since last meeting

- ❑ Meeting materials
- ❑ GIS data layers

Progress since last meeting

- ❑ Meeting materials
- ❑ GIS data layers
- ❑ Chronologies

Baseline Conditions

11 Working Group Meetings: Sept 18-27

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

208 Planning Process

Baseline Conditions

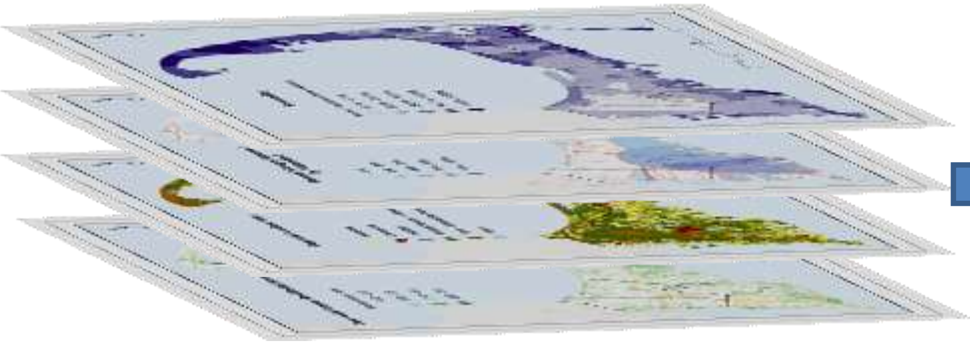
11 Working Group Meetings: Sept 18-27

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

Watershed Scenarios

11 Working Group Meetings: Dec 2-11



208 Planning Process

Baseline Conditions

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11 Working Group Meetings: Oct 21-Nov 5

Watershed Scenarios

11 Working Group Meetings: Dec 2-11

Watershed Event

November 13

Center for the Arts Dennis

Wrap up of Cape2O: ur in charge!

Summary of planning process to date

Outline of second 6 months of the 208 planning process

208 Planning Process

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

Goal of Today's Meeting:

To develop a shared understanding of the potential technologies and approaches identified to date, and the benefits and limitations of each; to explore the environmental, economic, and community impacts of a range of categories of solutions; and to identify priorities and considerations for applying technologies and approaches to remediate water quality impairments in your watershed.

Technologies and Approaches for Improving Water Quality

Technologies and Approaches for Improving Water Quality

- The Fact Sheets present various information on the technologies being considered.
- Additional information is contained on the Technology Matrix including the following:
  - Site Requirements
  - Construction, Project and Operation and Maintenance Costs
  - Reference Information
  - Regulatory Comments
- Input from the Stakeholders is requested regarding a technology's Public Acceptance

Technologies and Approaches for Improving Water Quality

- Comprehensive analysis of nutrient control technologies and approaches.

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- ❑ Workshop 3 will embark on hands on problem solving in each watershed to meet target load reductions.

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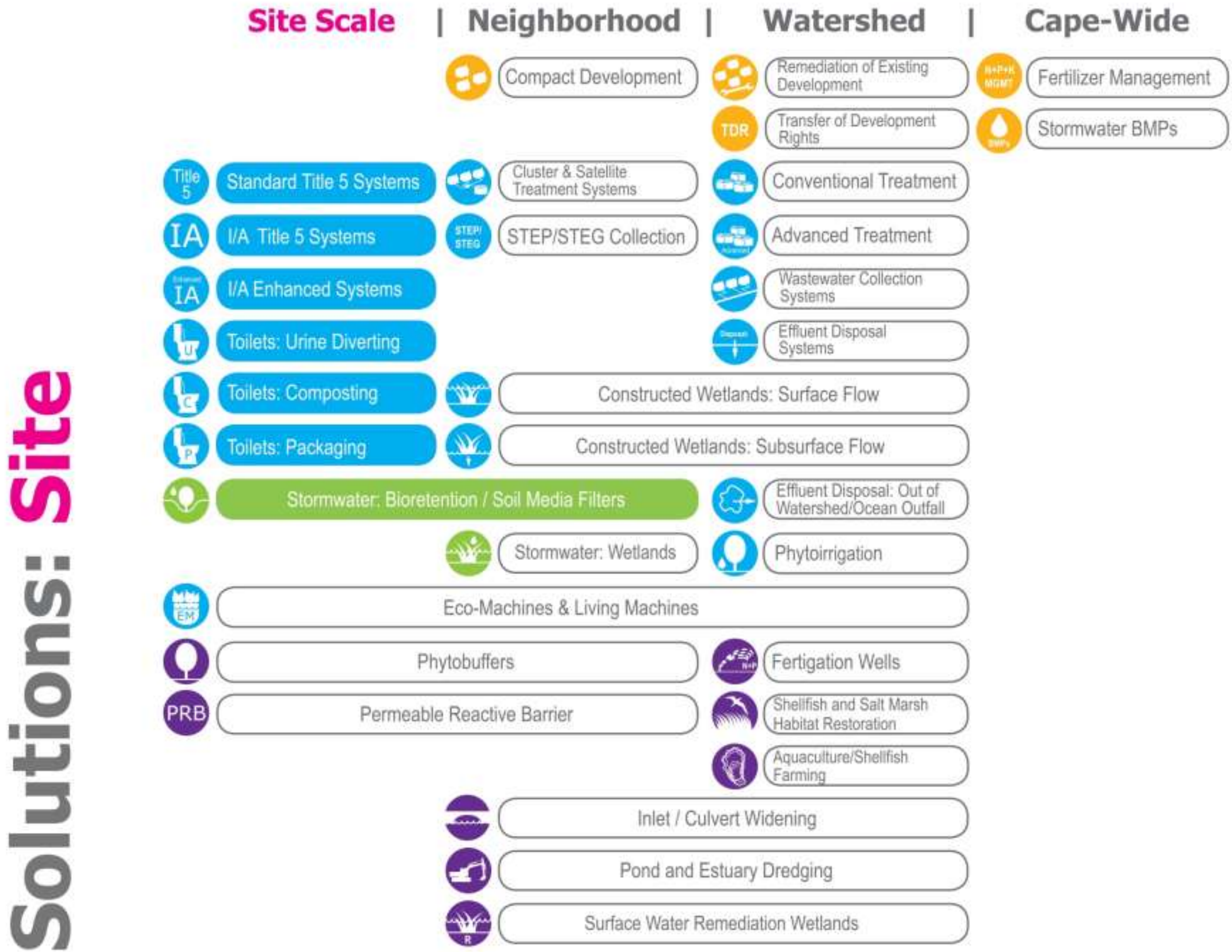
- Certain technologies or approaches will be effective at **preventing** nutrients from entering the water body. Others will be effective at **reducing** or **remediating** nutrients that are already in the groundwater or water body.
- Regulatory programs can address nutrient controls for both existing development and future development.


Site Scale | Neighborhood | Watershed | Cape-Wide
Compact Development
Remediation of Existing Development
N+P+K MGMT
Fertilizer Management
TDR
Transfer of Development Rights
BMPs
Stormwater BMPs
Title 5
Standard Title 5 Systems
Cluster & Satellite Treatment Systems
Conventional Treatment
IA
I/A Title 5 Systems
STEP/STEG
STEP/STEG Collection
Advanced Treatment
Enhanced IA
I/A Enhanced Systems
Wastewater Collection Systems
U
Toilets: Urine Diverting
Disposal
Effluent Disposal Systems
C
Toilets: Composting
Constructed Wetlands: Surface Flow
P
Toilets: Packaging
Constructed Wetlands: Subsurface Flow
Stormwater: Bioretention / Soil Media Filters
Effluent Disposal: Out of Watershed/Ocean Outfall
Stormwater: Wetlands
Phytoirrigation
EM
Eco-Machines & Living Machines
Phytobuffers
N+P
Fertigation Wells
PRB
Permeable Reactive Barrier
Shellfish and Salt Marsh Habitat Restoration
Aquaculture/Shellfish Farming
Inlet / Culvert Widening
Pond and Estuary Dredging
R
Surface Water Remediation Wetlands
Solutions


Solutions: Site
Site Scale | Neighborhood | Watershed | Cape-Wide
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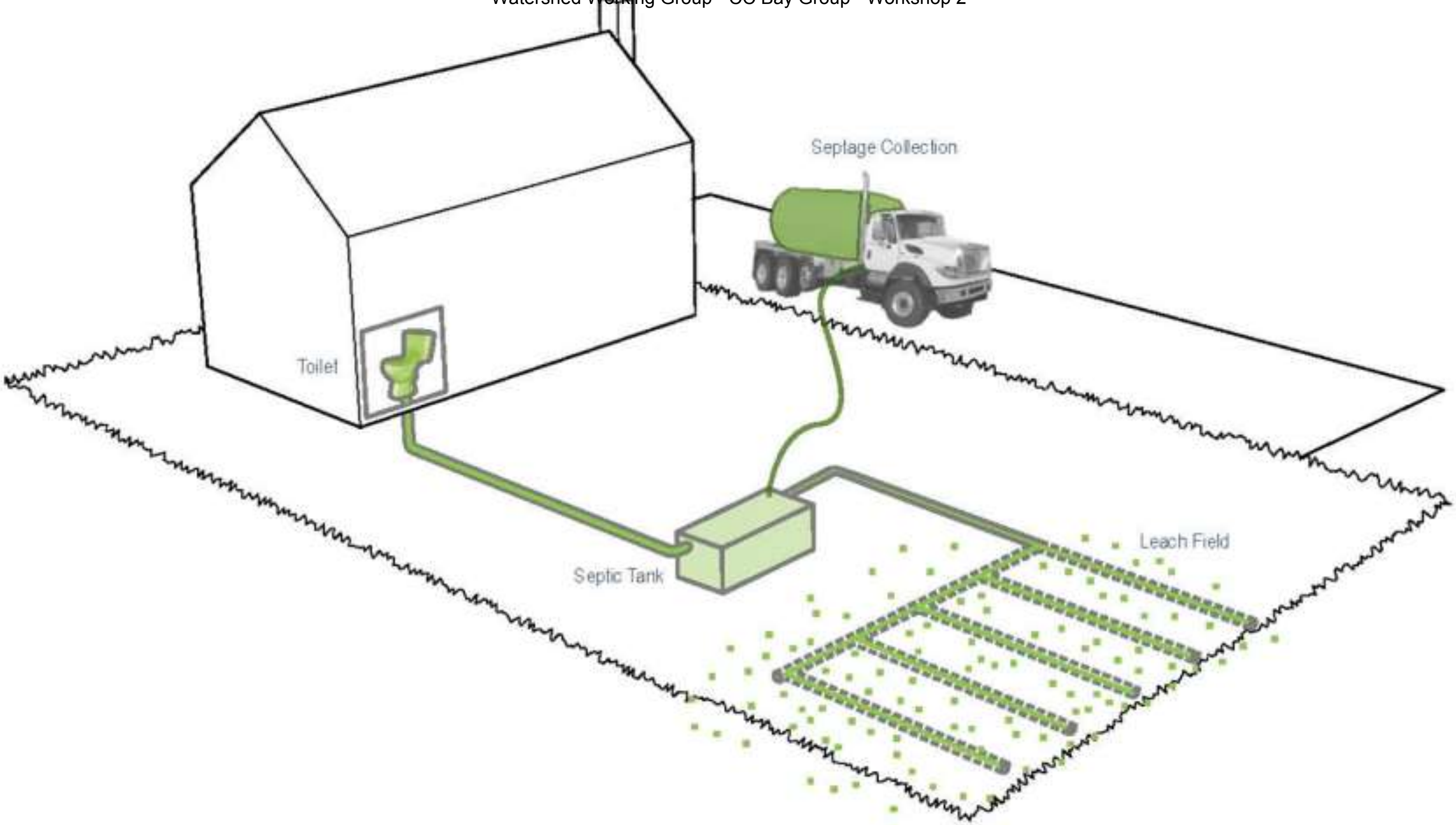
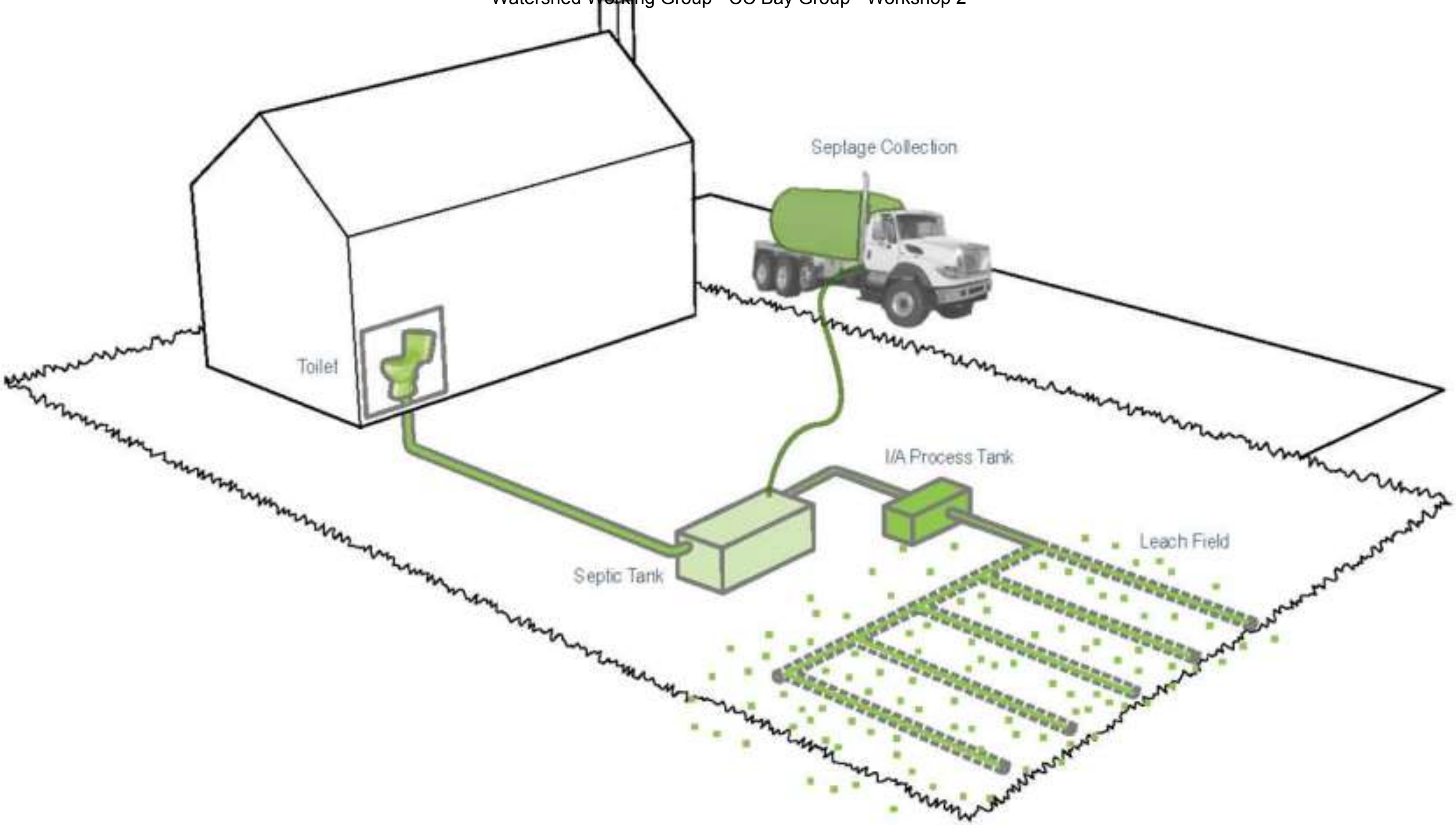


Scale: SITE
Target: WASTEWATER

Standard Title 5 Systems

Title 5

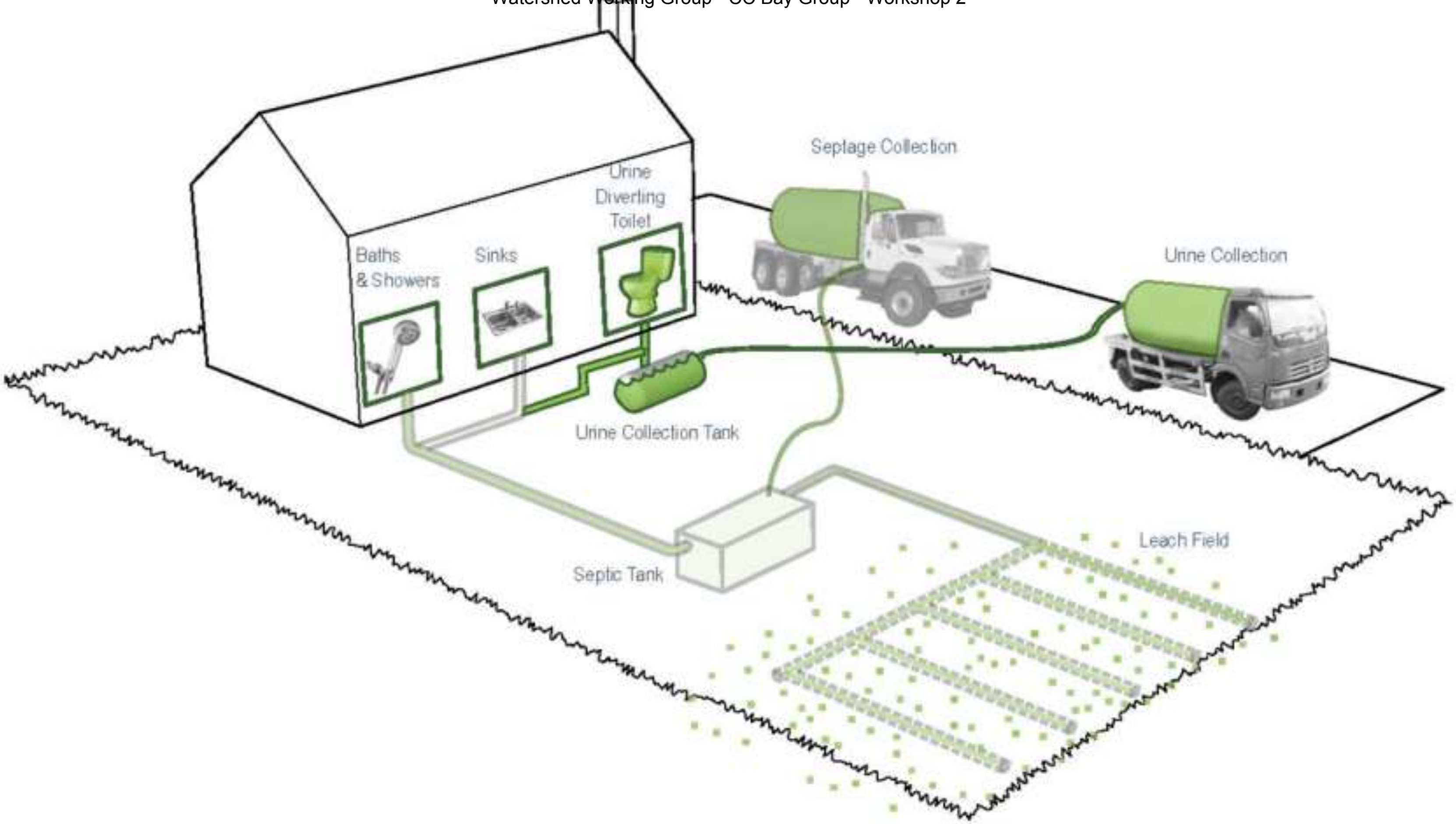


Scale: SITE
Target: WASTEWATER

I/A Title 5 Systems

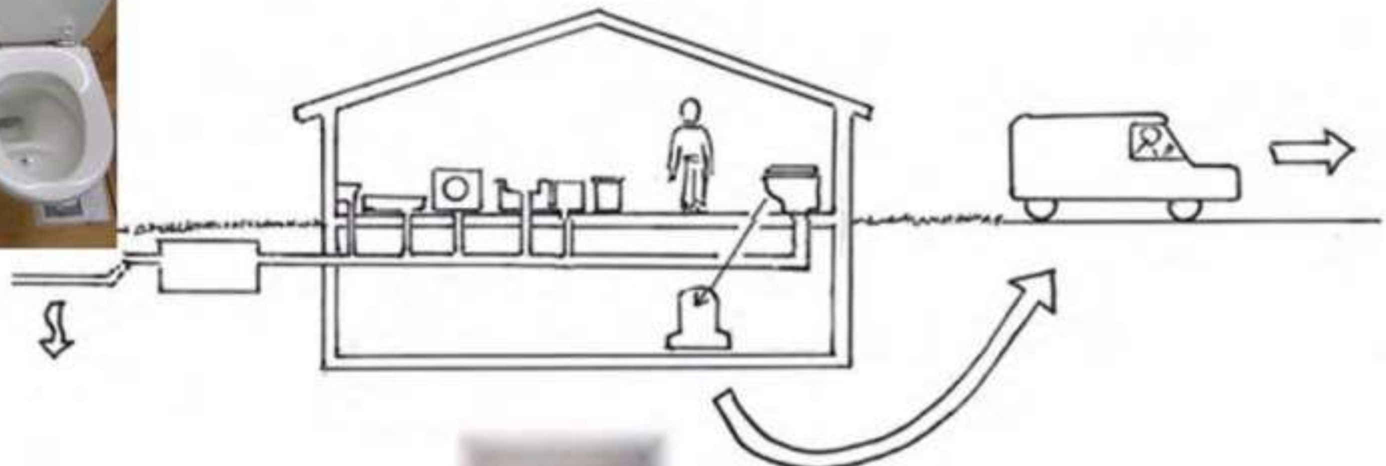
Enhanced IA

IA



Scale: SITE
Target: WASTEWATER

Toilets: Urine Diverting



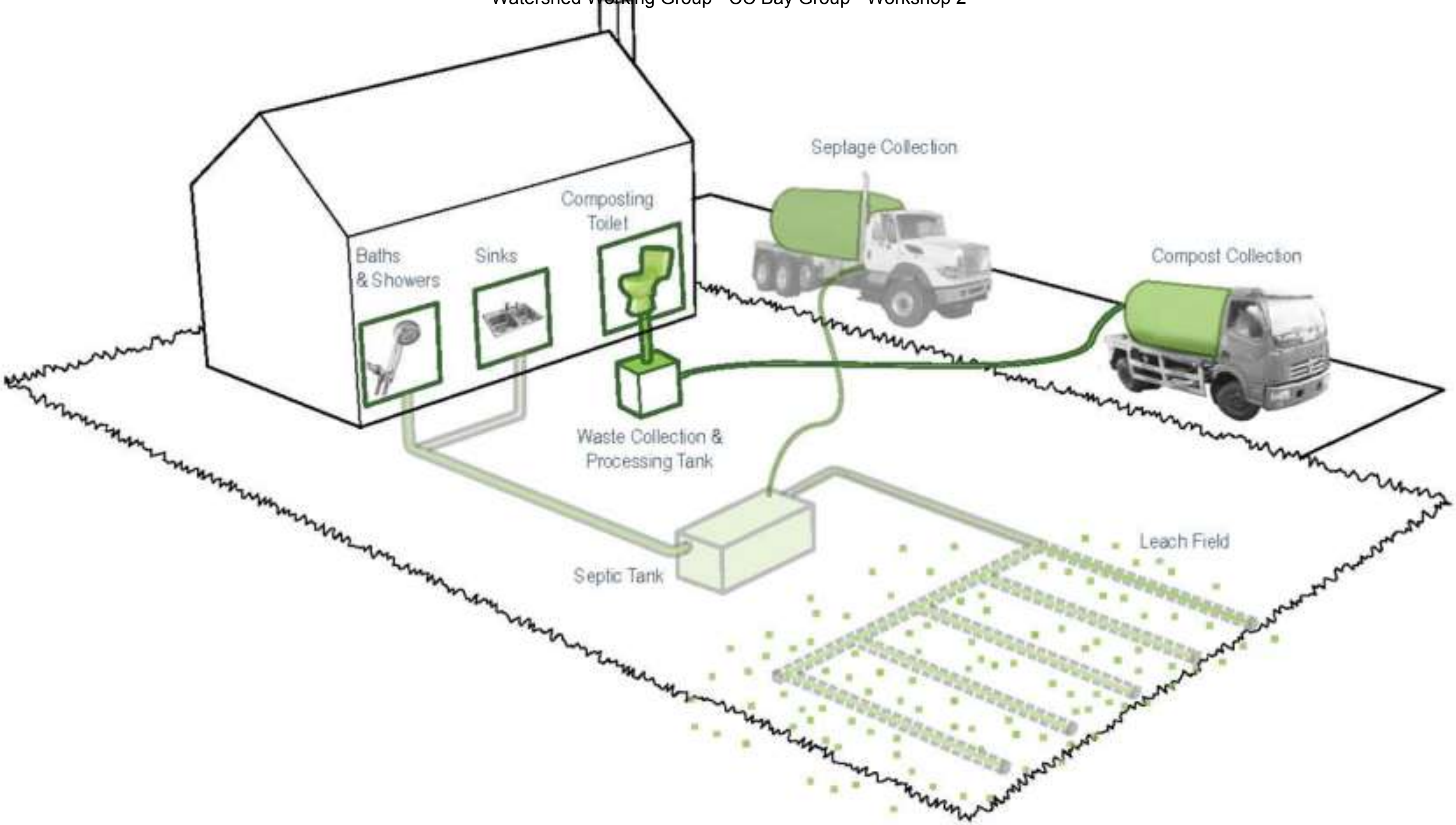
Waterless
Urinal

IBC container
(220 gallons)

40" x 40" x48"

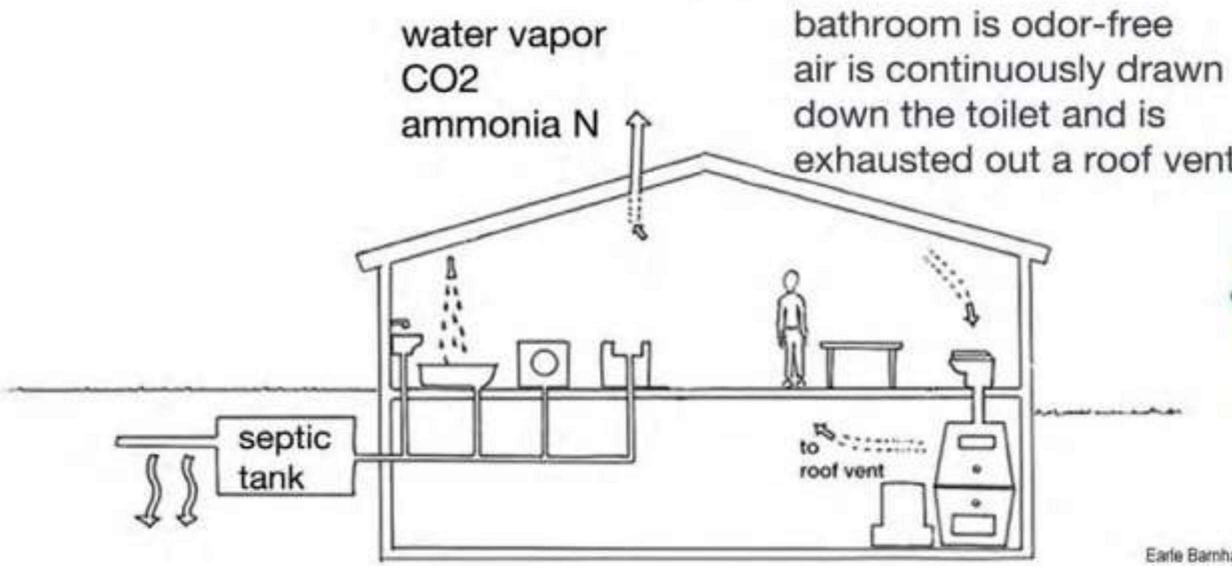
Source: Earle Barnhart, The Green Center Inc. and Horsley-Witten Group Inc.

Toilets: Urine Diverting



Scale: SITE
Target: WASTEWATER

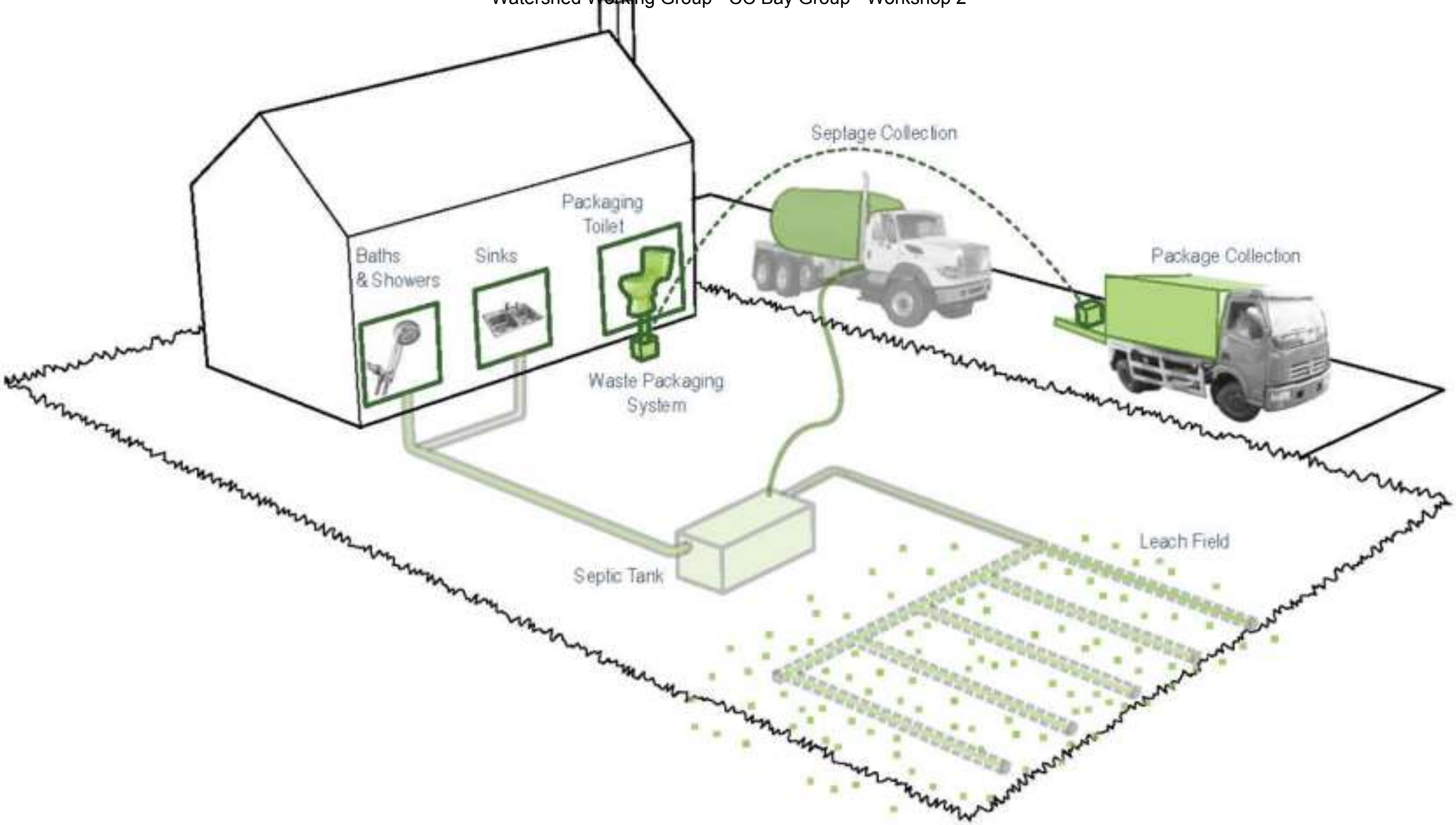
Toilets: Composting



Earle Barnhart
The Green Center, Inc

Source: Earle Barnhart, The Green Center Inc.

Toilets: Composting



Scale: SITE
Target: WASTEWATER

Toilets: Packaging

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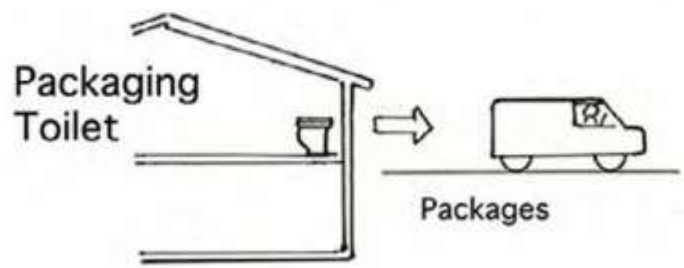
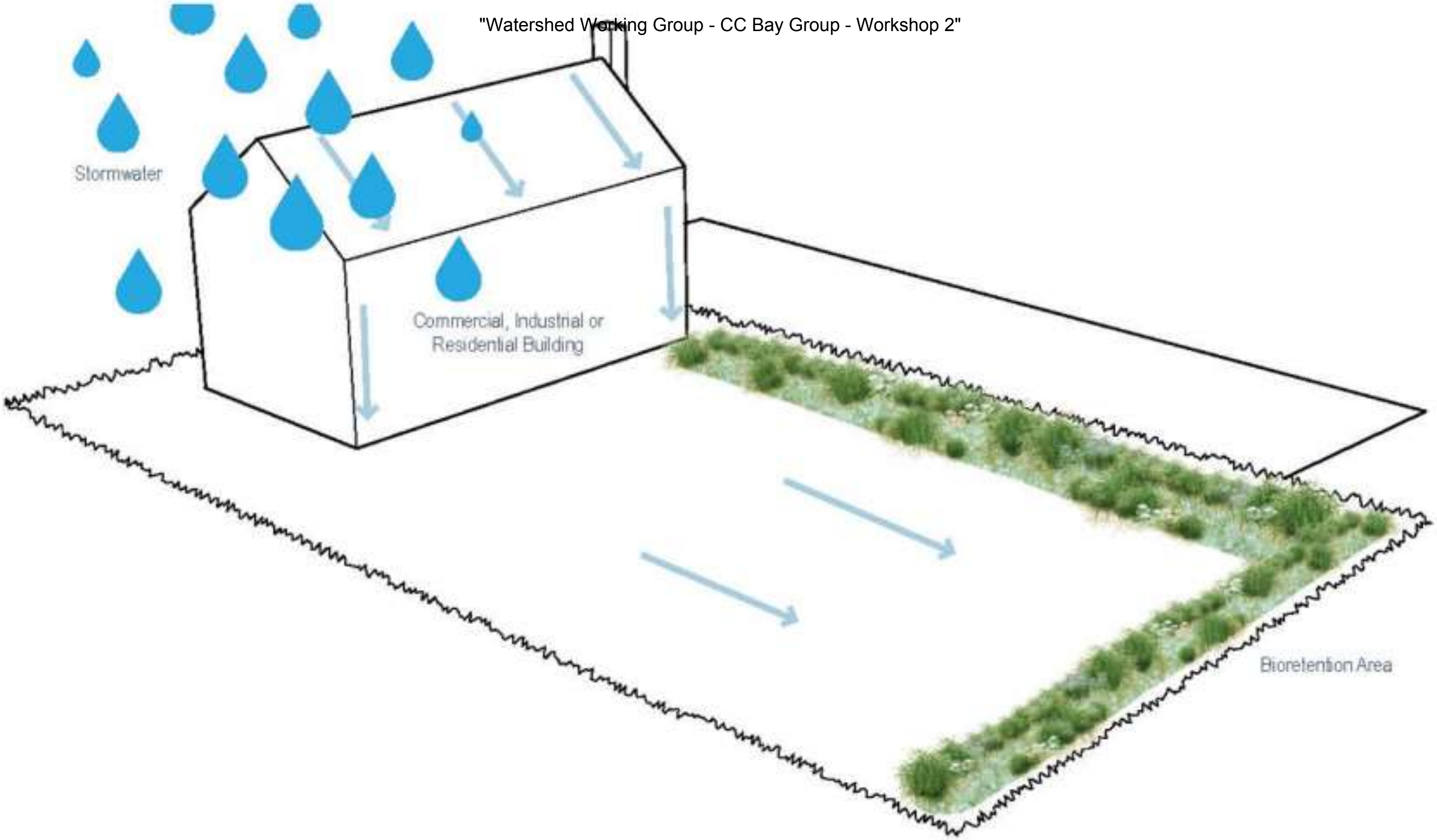


Source: Earle Barnhart, The Green Center Inc.

Toilets: Packaging



Scale: SITE
Target: STORMWATER

Stormwater: Bioretention / Soil Media Filters

Precedent: 12th Ave. Stormwater Project, Portland, OR
Source: City of Portland

Stormwater: Bioretention / Soil Media Filters

Rain Gardens


Site Scale | Neighborhood | Watershed | Cape-Wide
Solutions: Neighborhood
Compact Development
Remediation of Existing Development
Fertilizer Management
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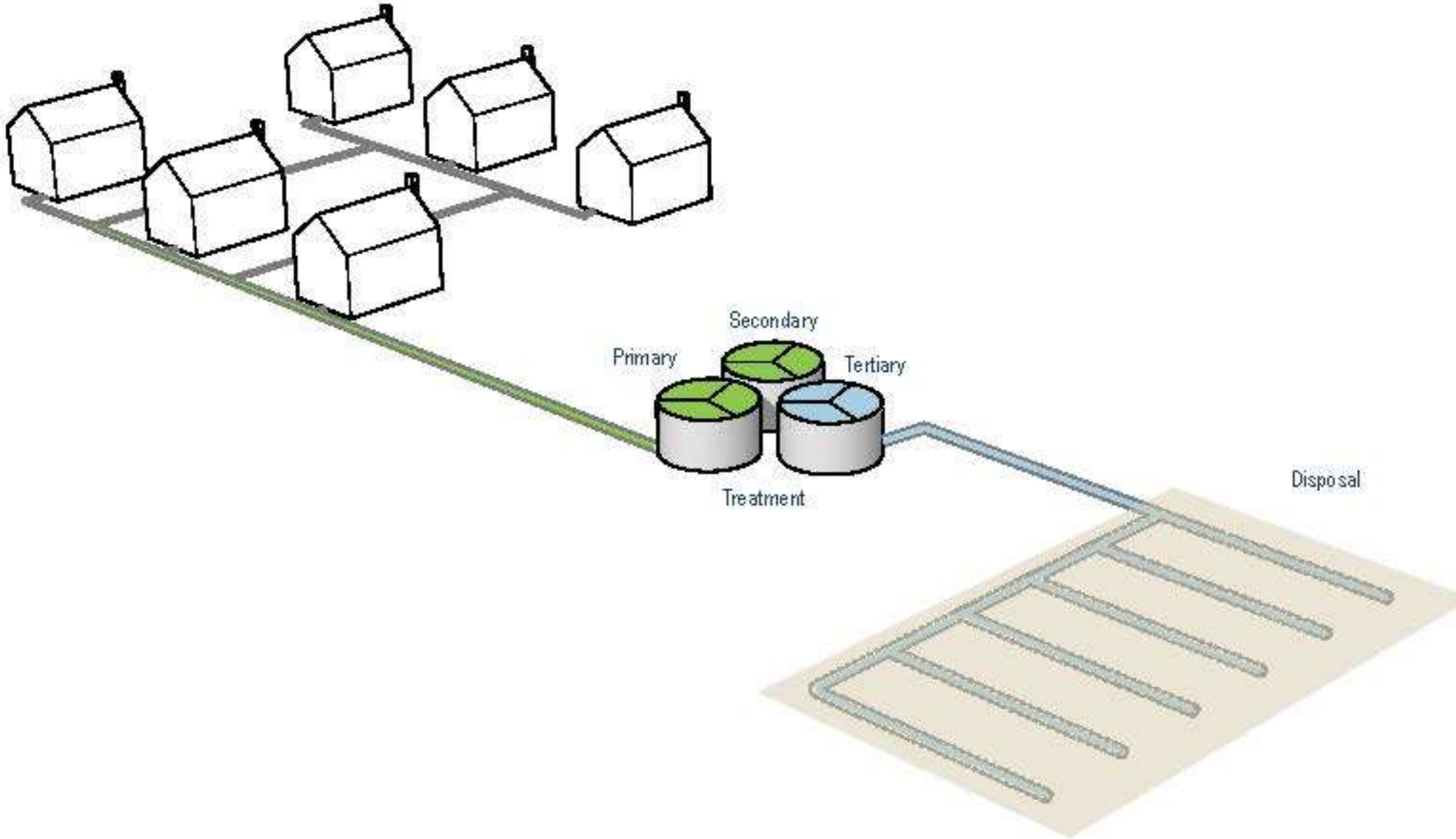
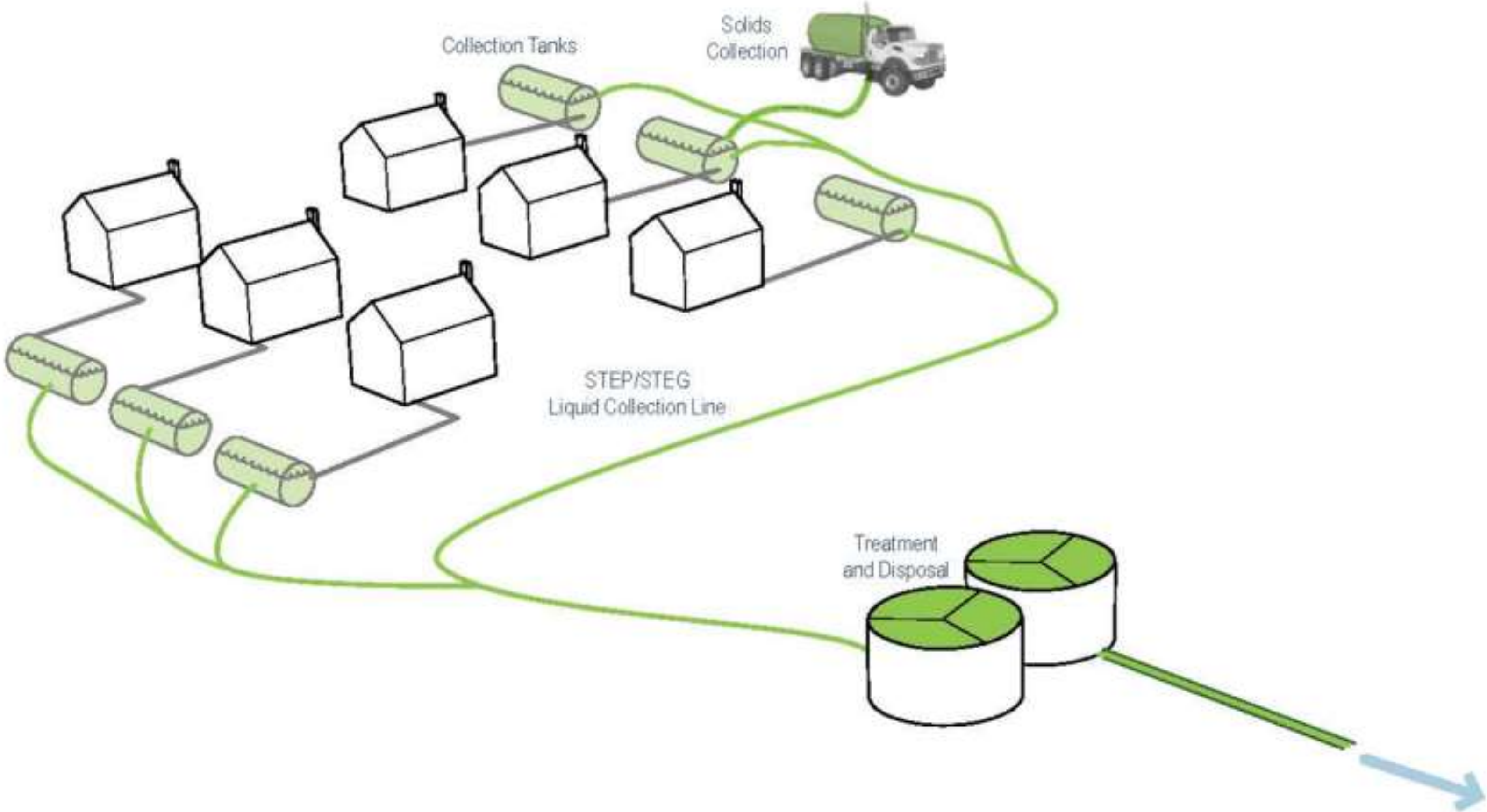
Surface Water Remediation Wetlands



Scale: NEIGHBORHOOD
Target: WASTEWATER

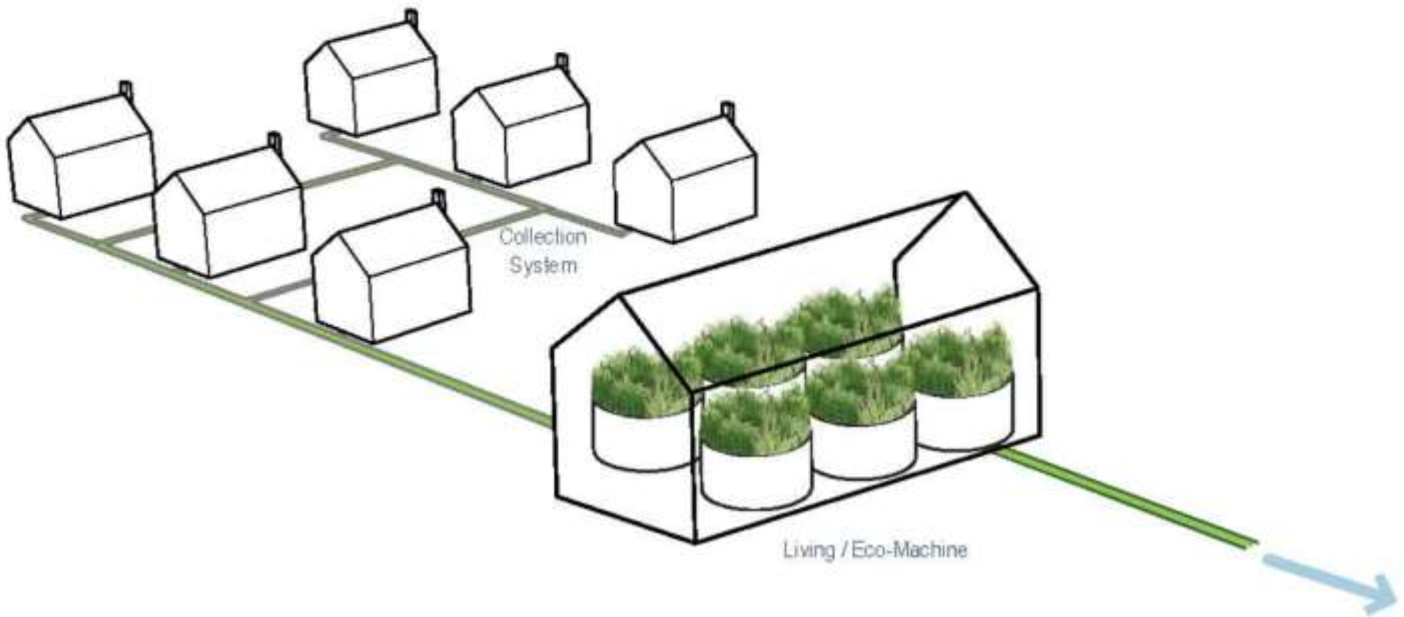
Cluster & Satellite Treatment Systems



Scale: NEIGHBORHOOD
Target: WASTEWATER

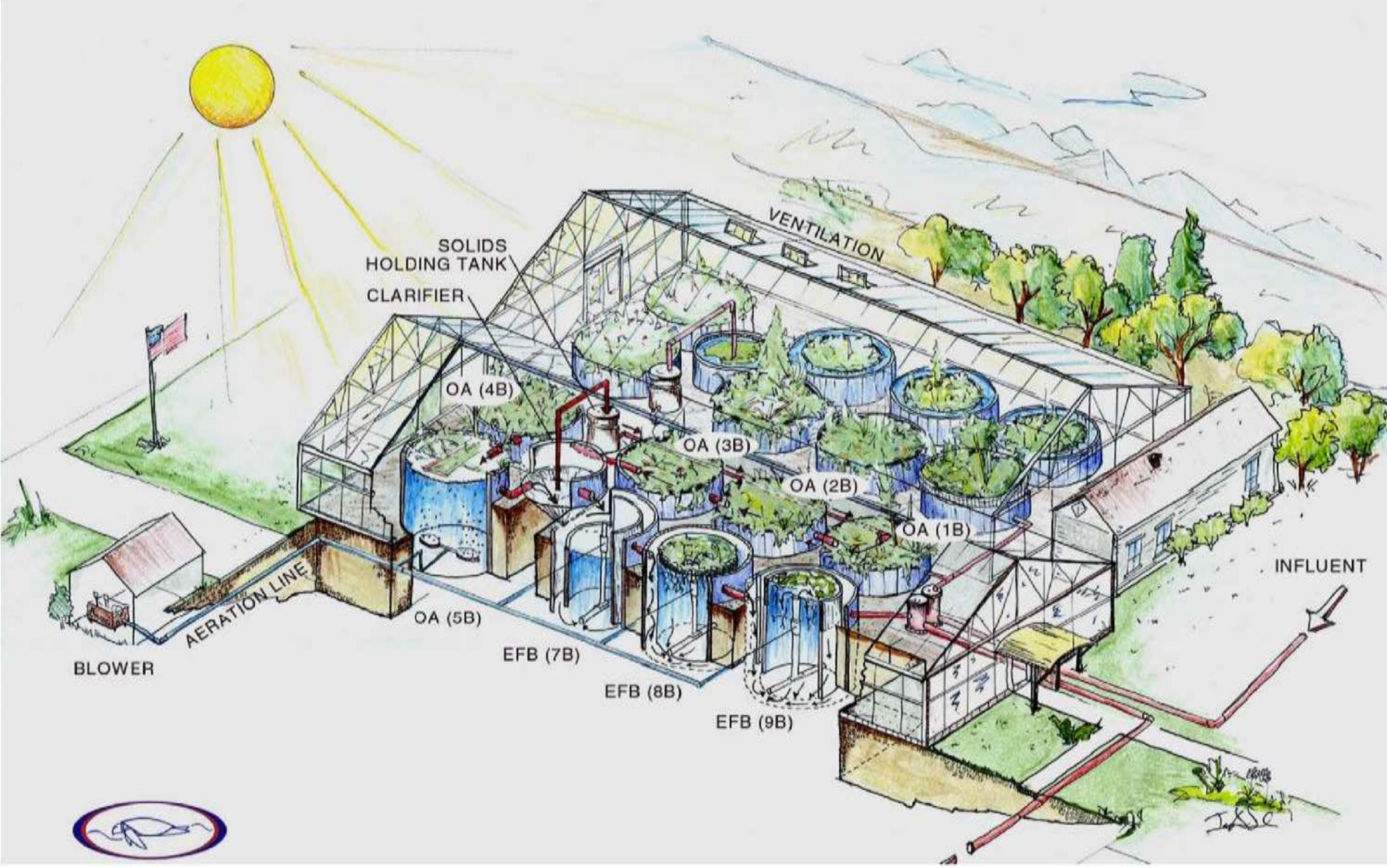
STEP / STEG Collection

STEP/ STEG



Scale: NEIGHBORHOOD
Target: WASTEWATER

Eco-Machines and
Living Machines

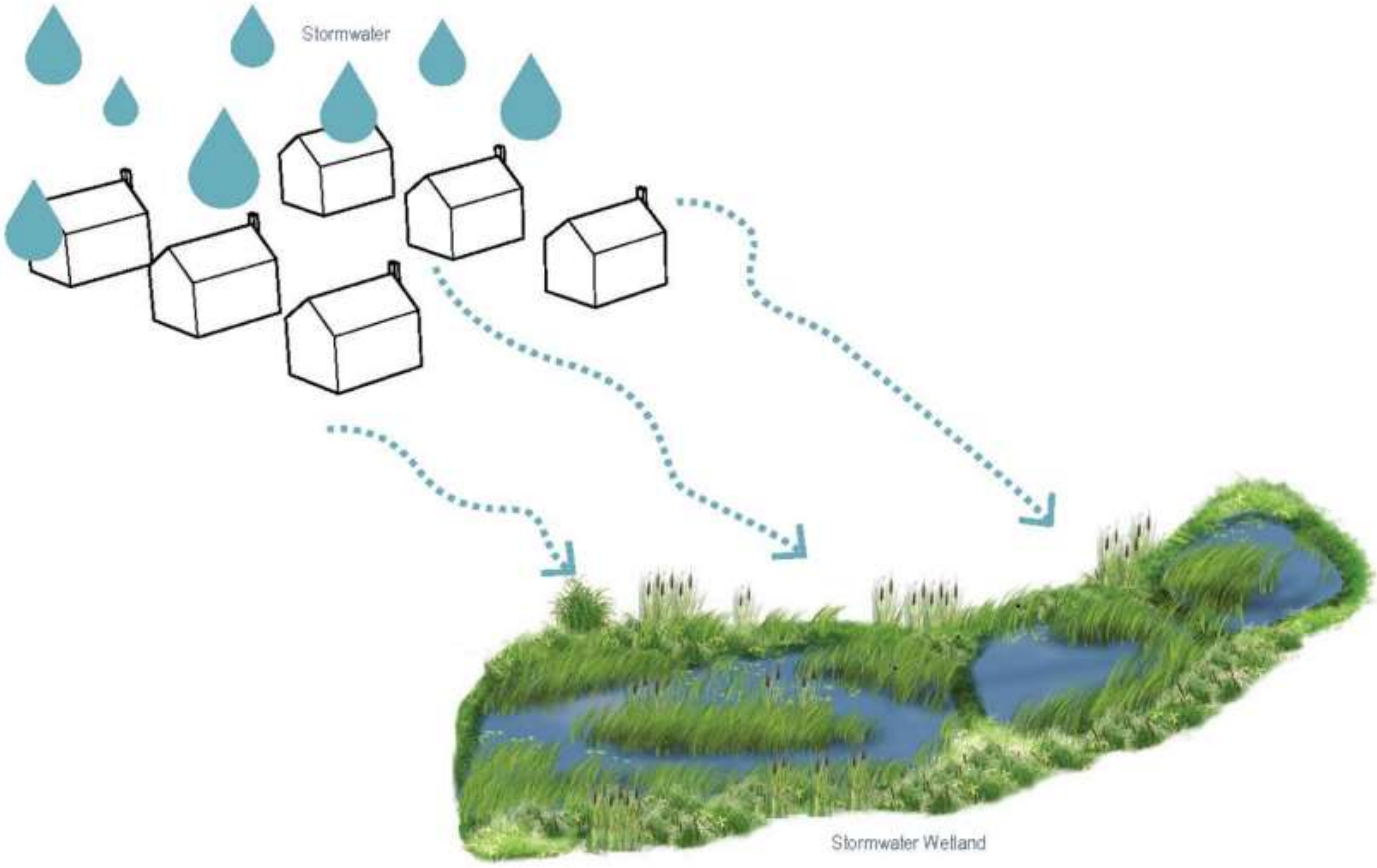


Precedent: Living Machine, South Burlington, VT
Source: Todd Ecological

Eco-Machines and
Living Machines

Precedent: Living Machine - South Burlington, VT + Photobioreactors - Falmouth, MA
Source: Todd Ecological and Tom Cambareri

Eco-Machines and Living Machines



Scale: NEIGHBORHOOD
Target: STORMWATER

Stormwater Wetlands

Solutions: Watershed

Site Scale | Neighborhood | Watershed | Cape-Wide

- Compact Development
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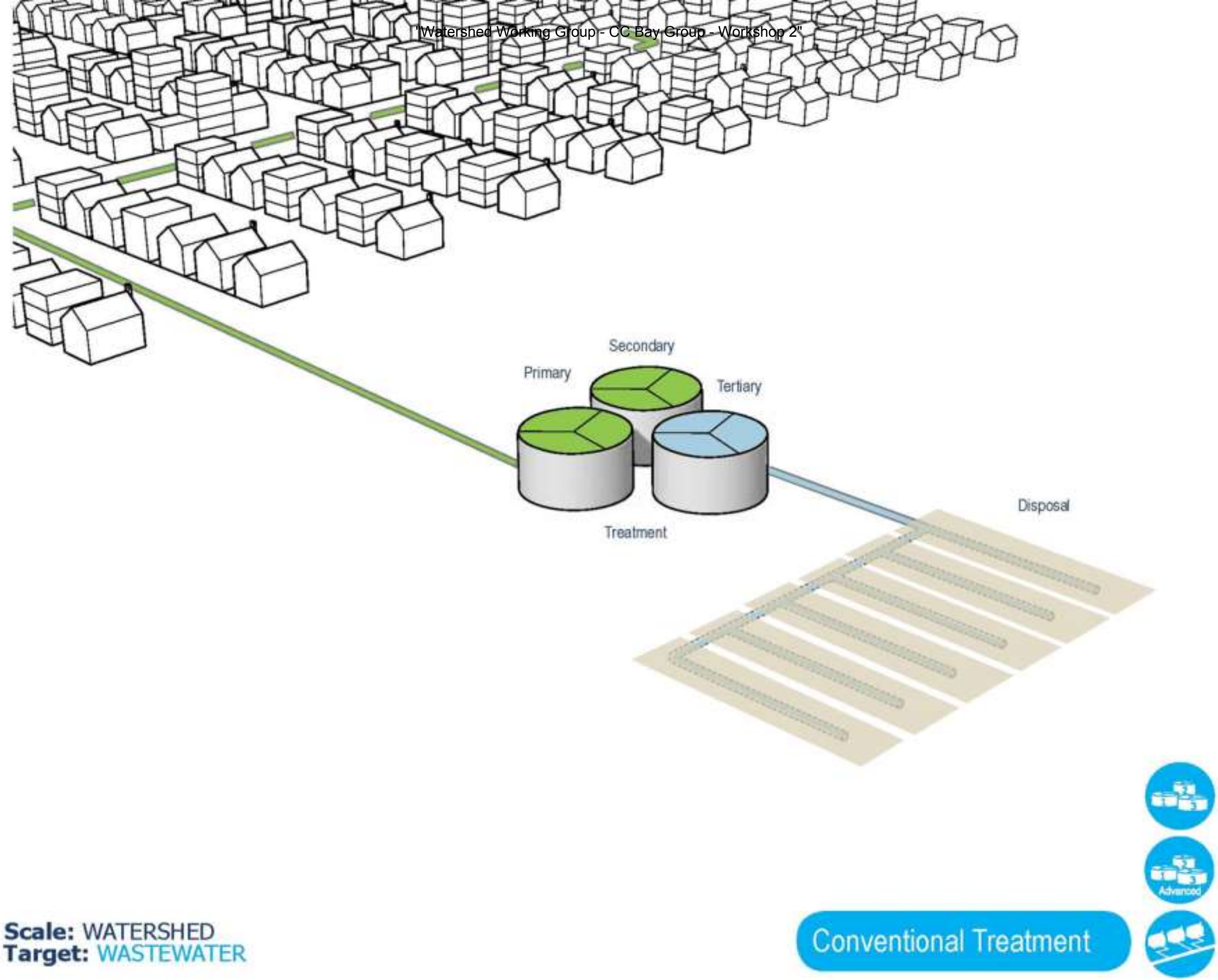
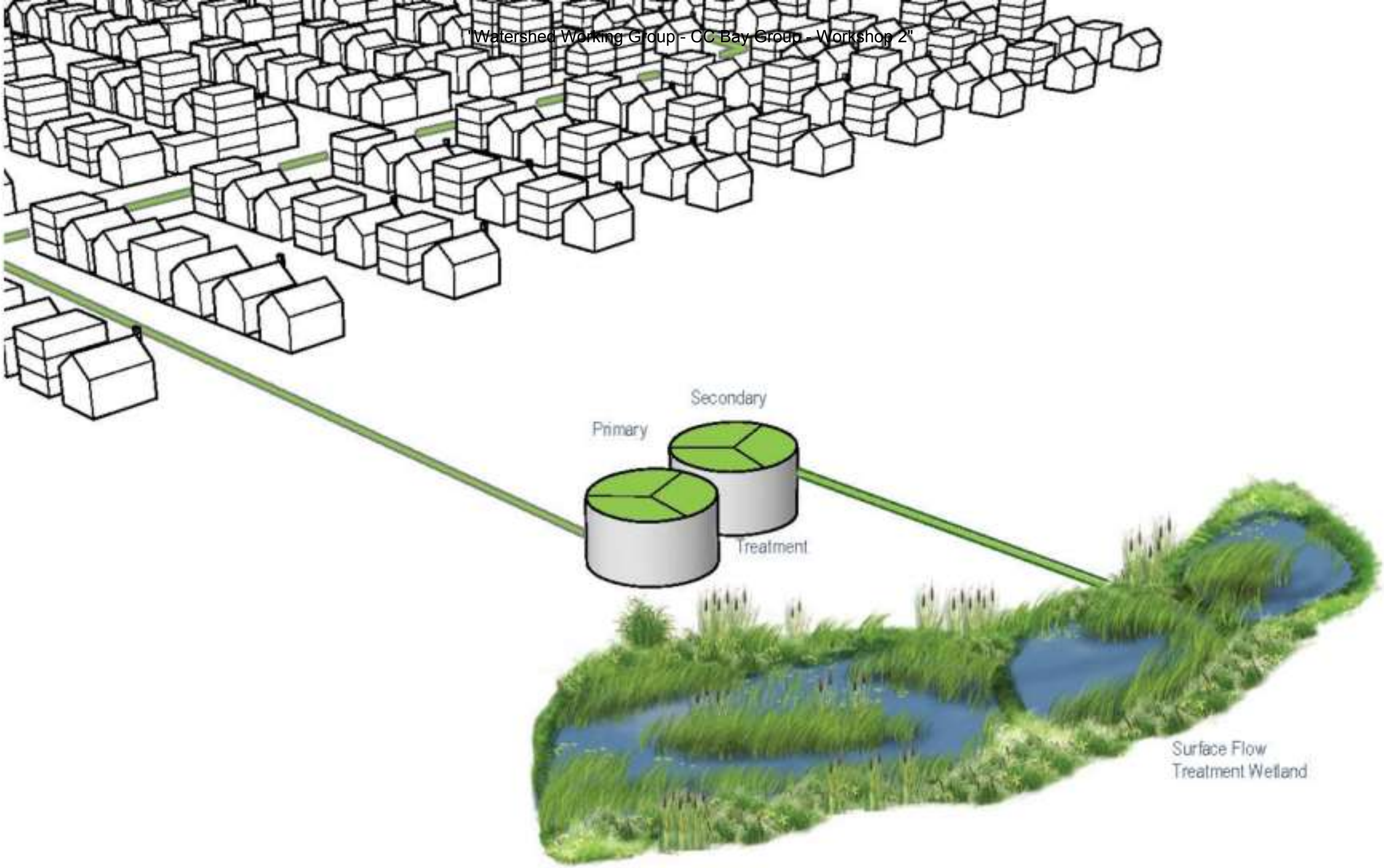
- Inlet / Culvert Widening
- Pond and Estuary Dredging
- Surface Water Remediation Wetlands



Scale: WATERSHED
Target: WASTEWATER

Conventional Treatment

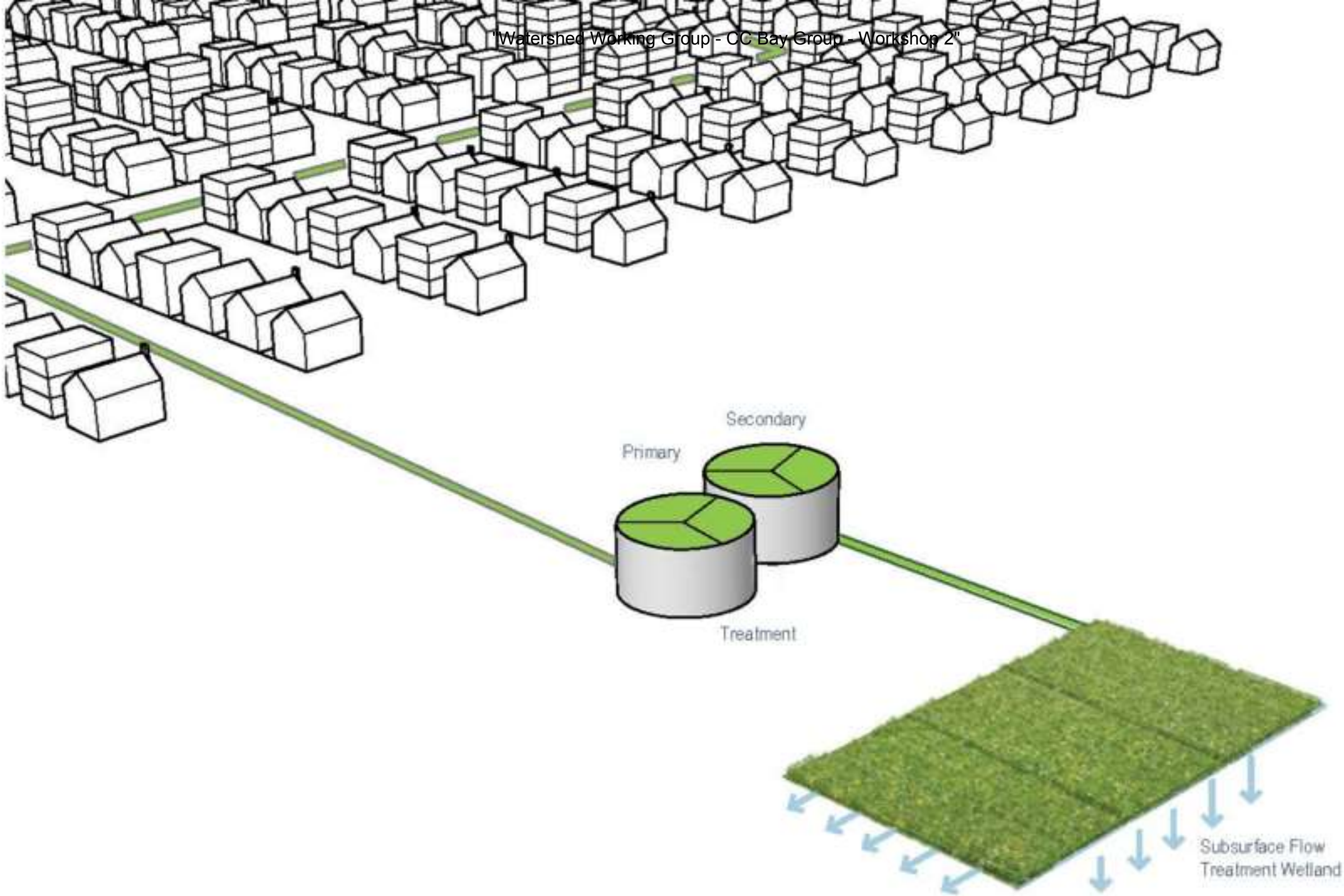


Scale: WATERSHED
Target: WASTEWATER

Constructed Wetlands: Surface Flow

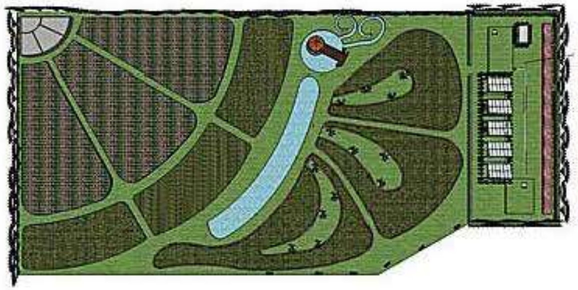
Precedent: Talking Waters Garden - Albany, OR
Source: Kate Kennen

Constructed Wetlands: Surface Flow



Scale: WATERSHED
Target: WASTEWATER

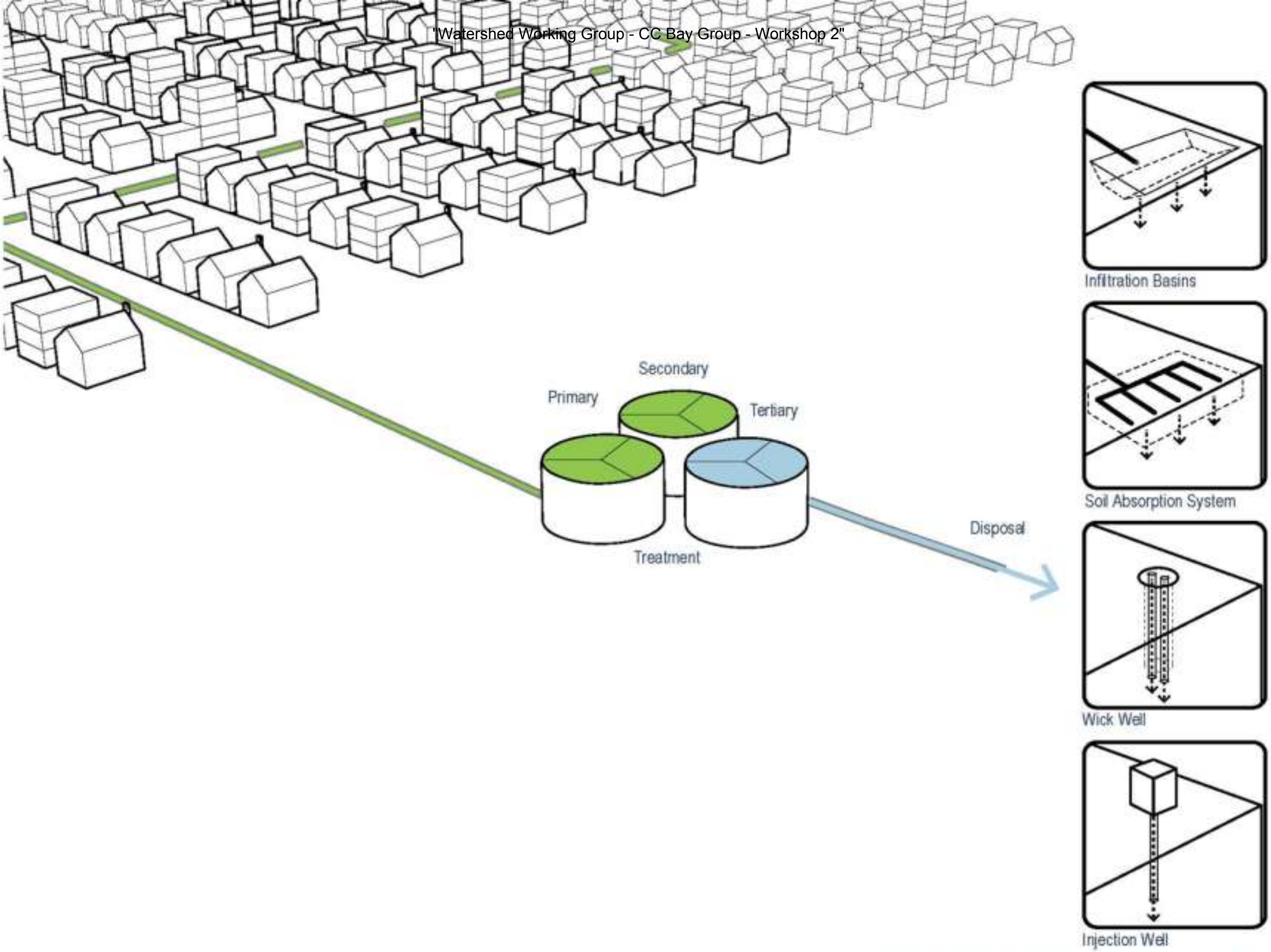
Constructed Wetlands: Subsurface Flow



Precedent: Koh Phi Phi Treatment Wetland, Thailand

Source: Hans Brix

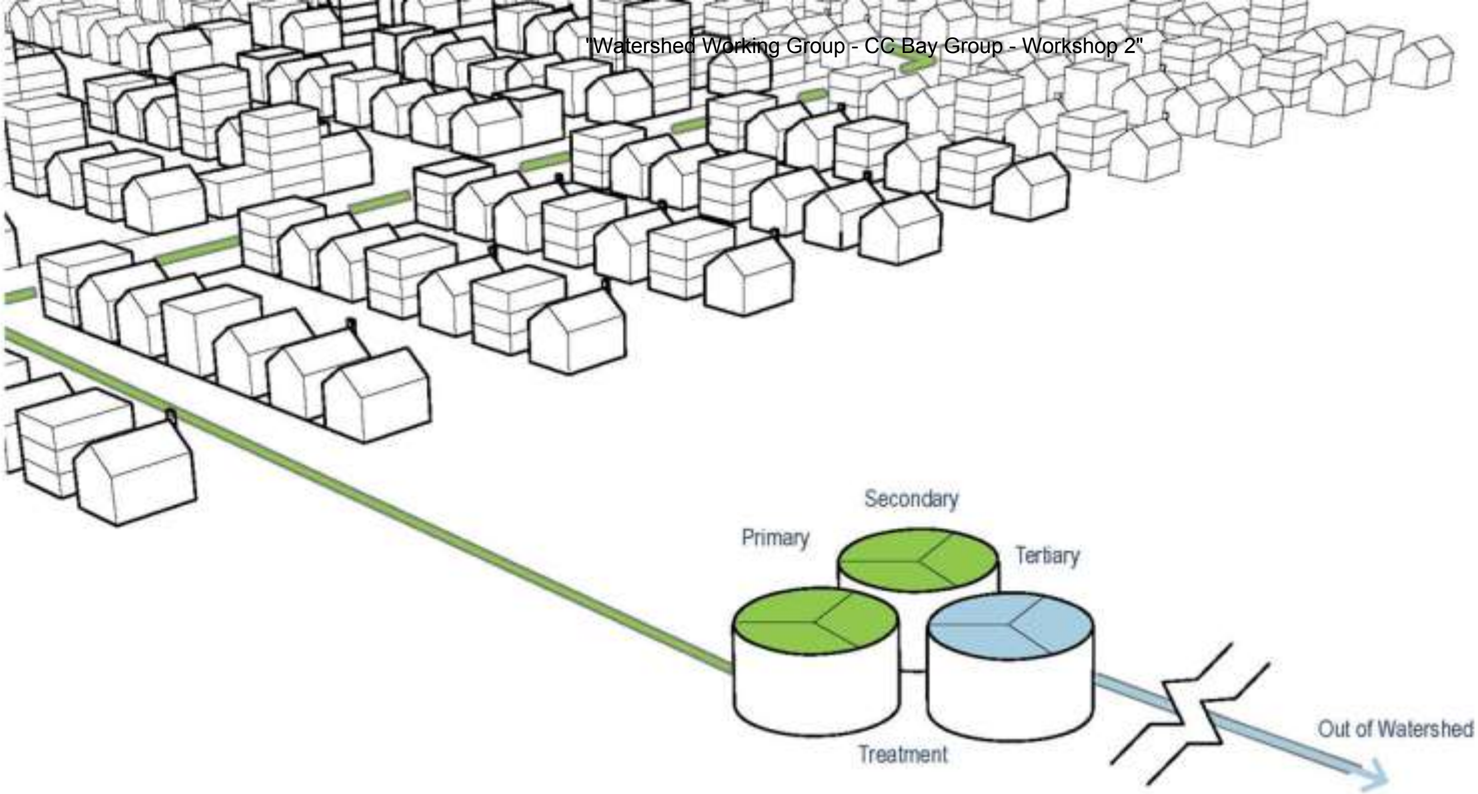
Constructed Wetlands:
Subsurface Flow



Scale: WATERSHED
Target: WASTEWATER

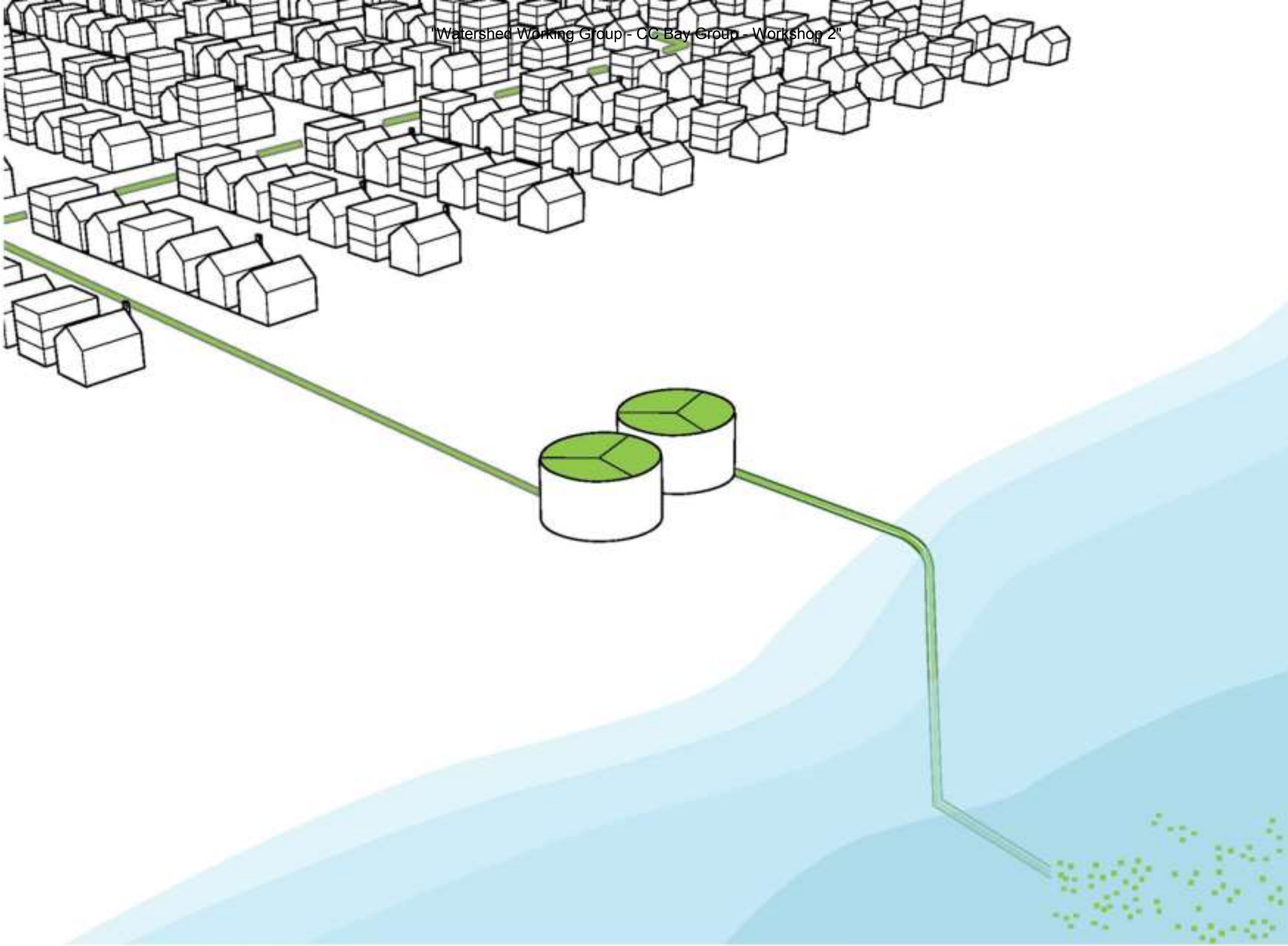
Effluent Disposal Systems

Disposal:



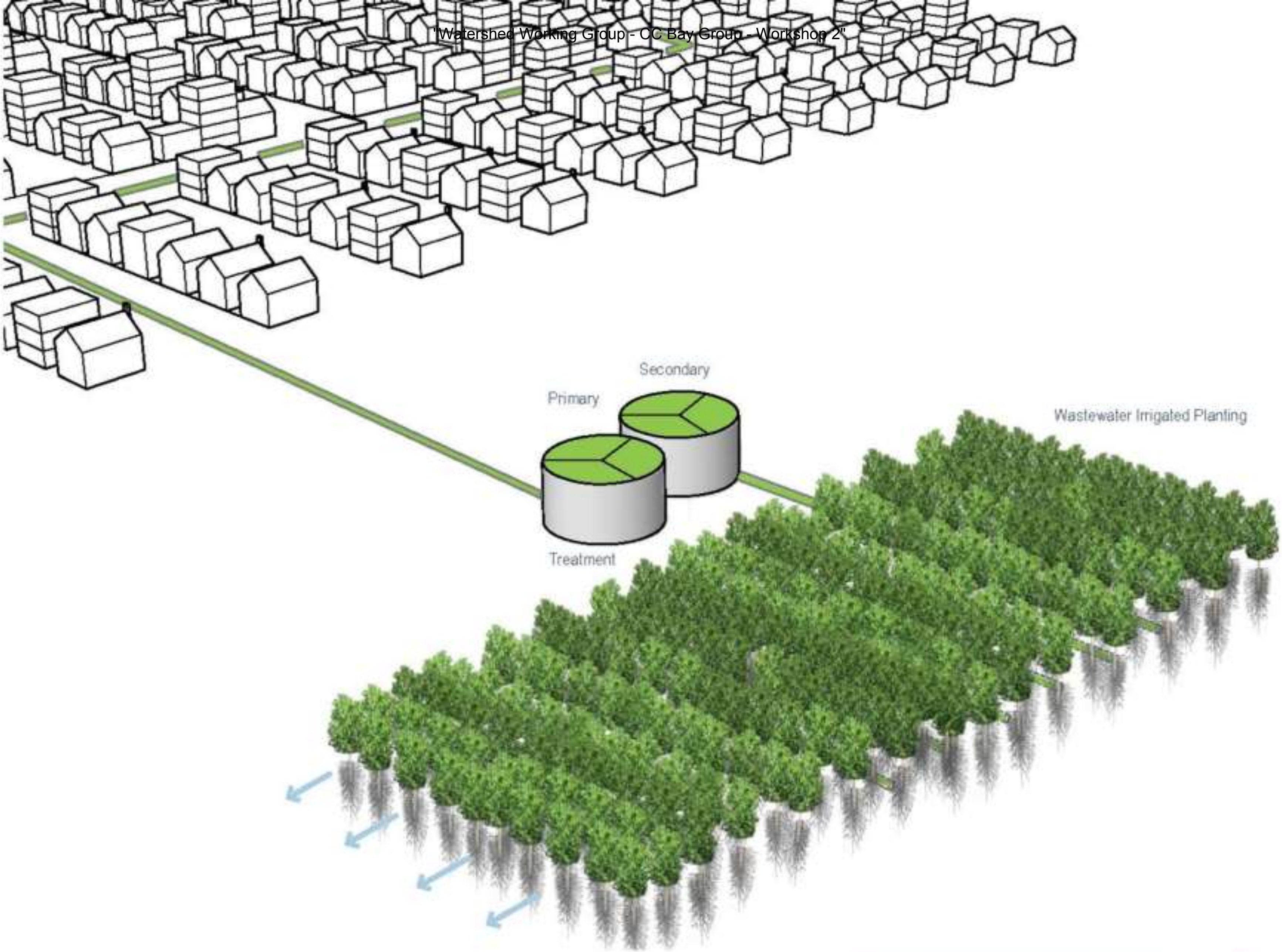
Scale: WATERSHED
Target: WASTEWATER

Effluent Disposal: Out of Watershed



Scale: WATERSHED
Target: WASTEWATER

Effluent Disposal: Ocean Outfall



Scale: WATERSHED
Target: WASTEWATER

Phytoirrigation

Precedent: Woodburn OR, Wastewater Treatment Facility
Source: CH2MHill

Phytoirrigation

Precedent: Woodburn OR, Wastewater Treatment Facility
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Phytoirrigation

Solutions: Ex. Water

Site Scale | Neighborhood | Watershed | Cape-Wide

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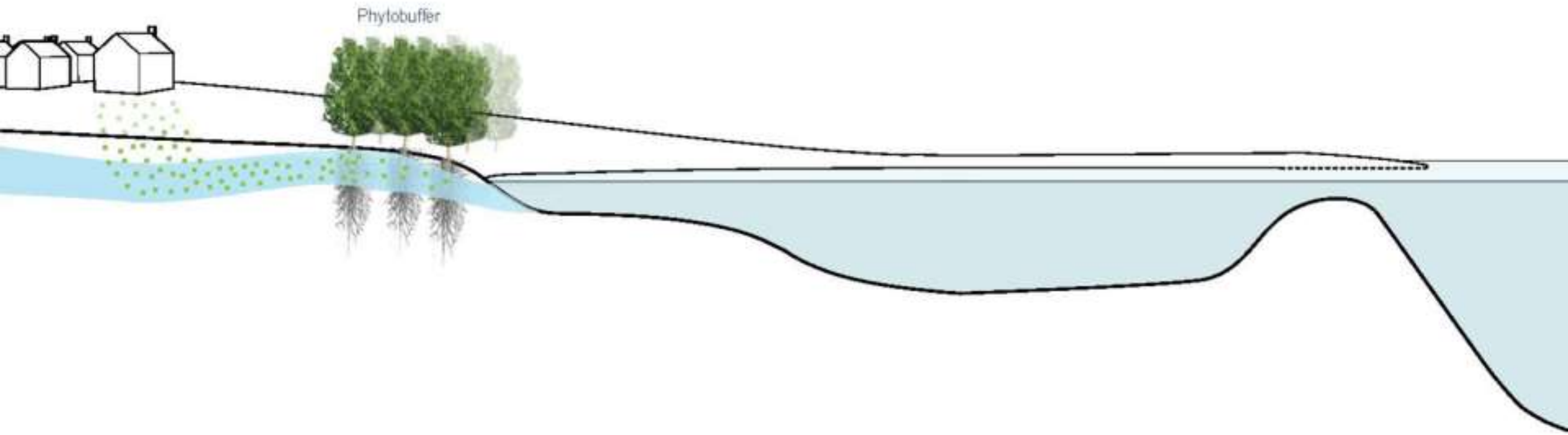
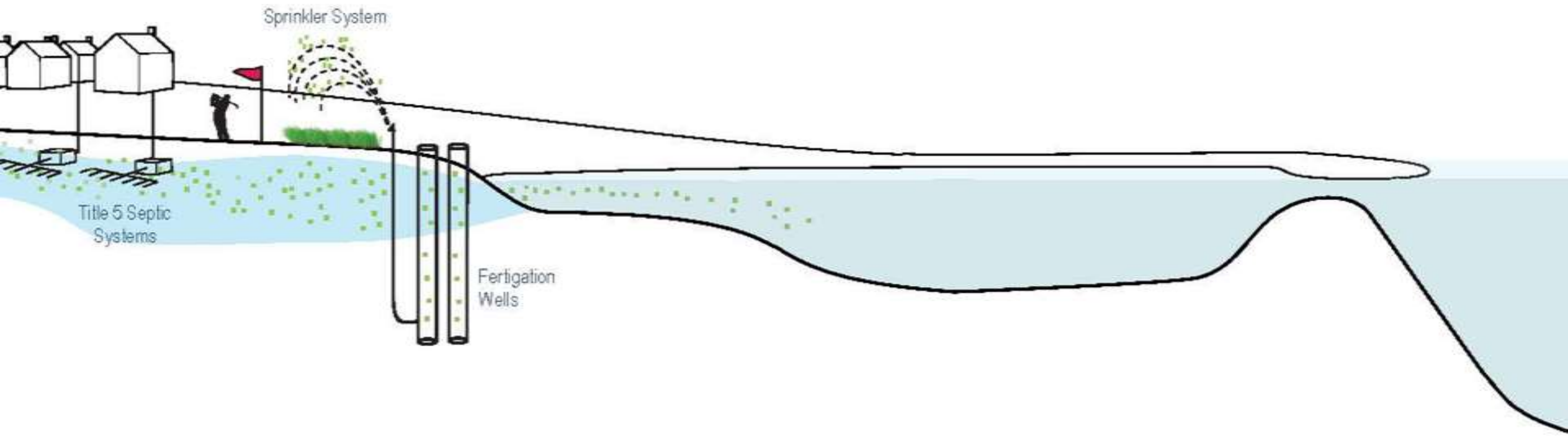


Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Phytobuffers

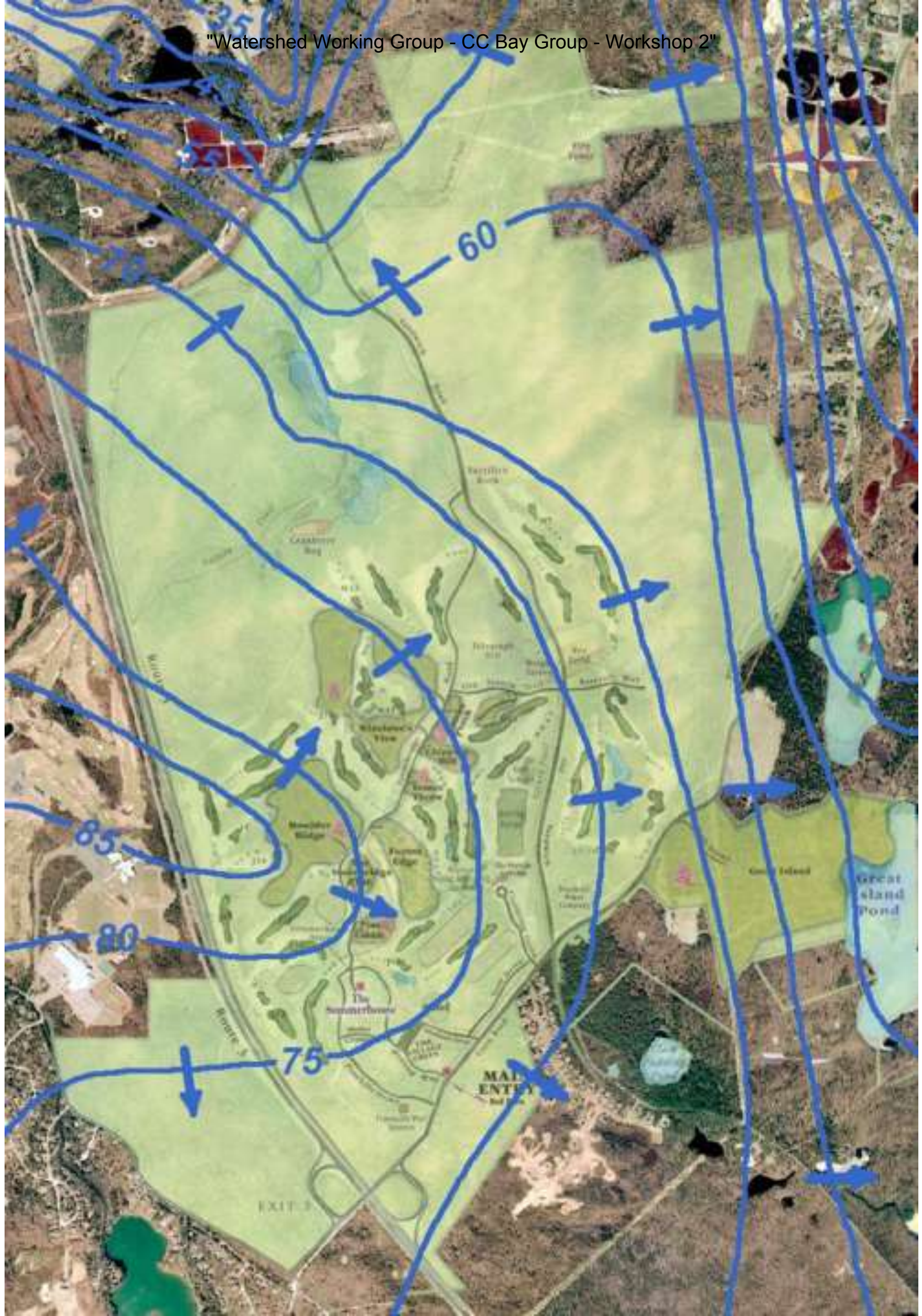
Precedent: Phytobuffer - Kavcee, WY
Source: Sand Creek Consultants

Phytobuffers

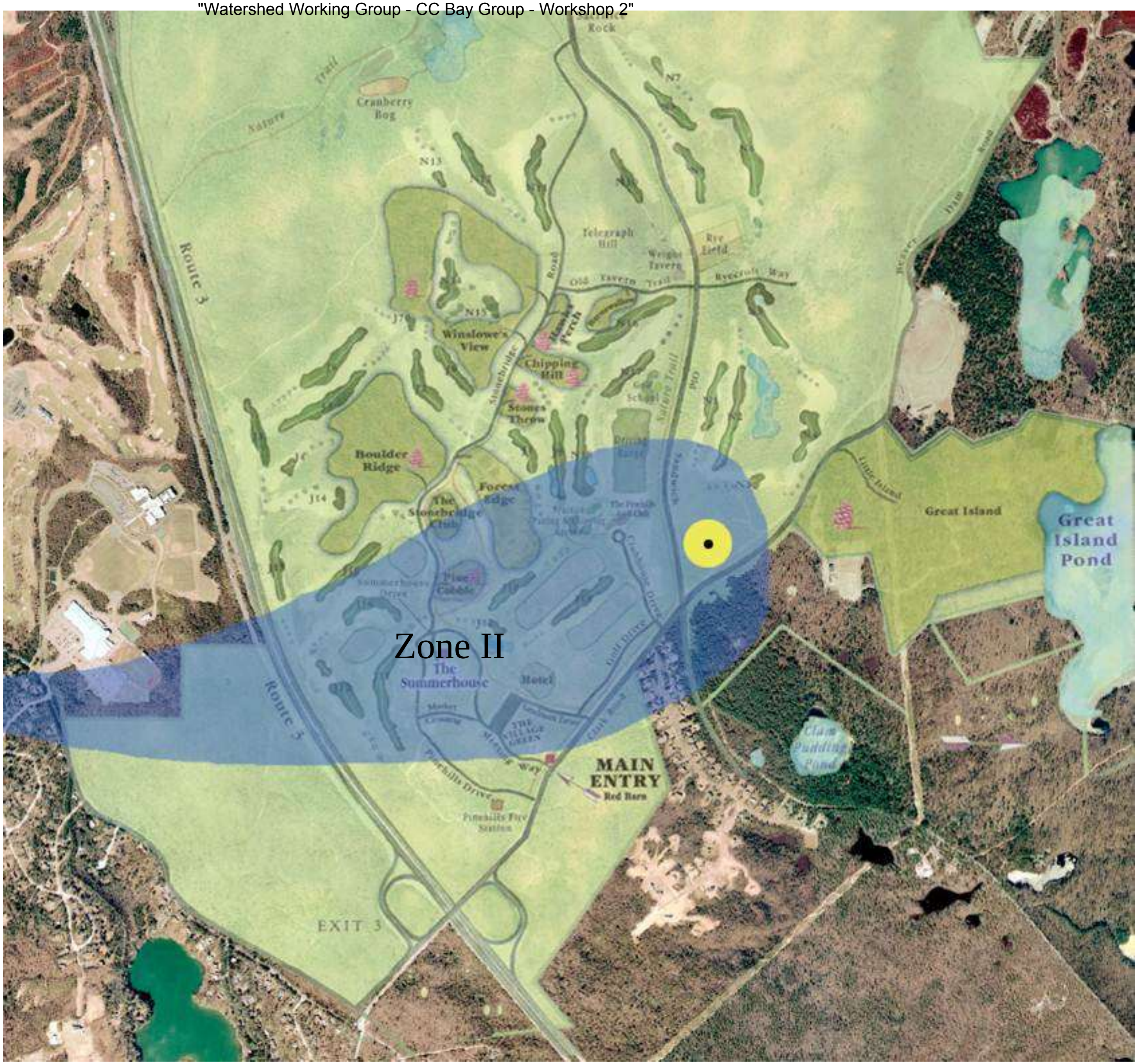


Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Fertigation Wells



Precedent:
Pine Hills
Plymouth, MA



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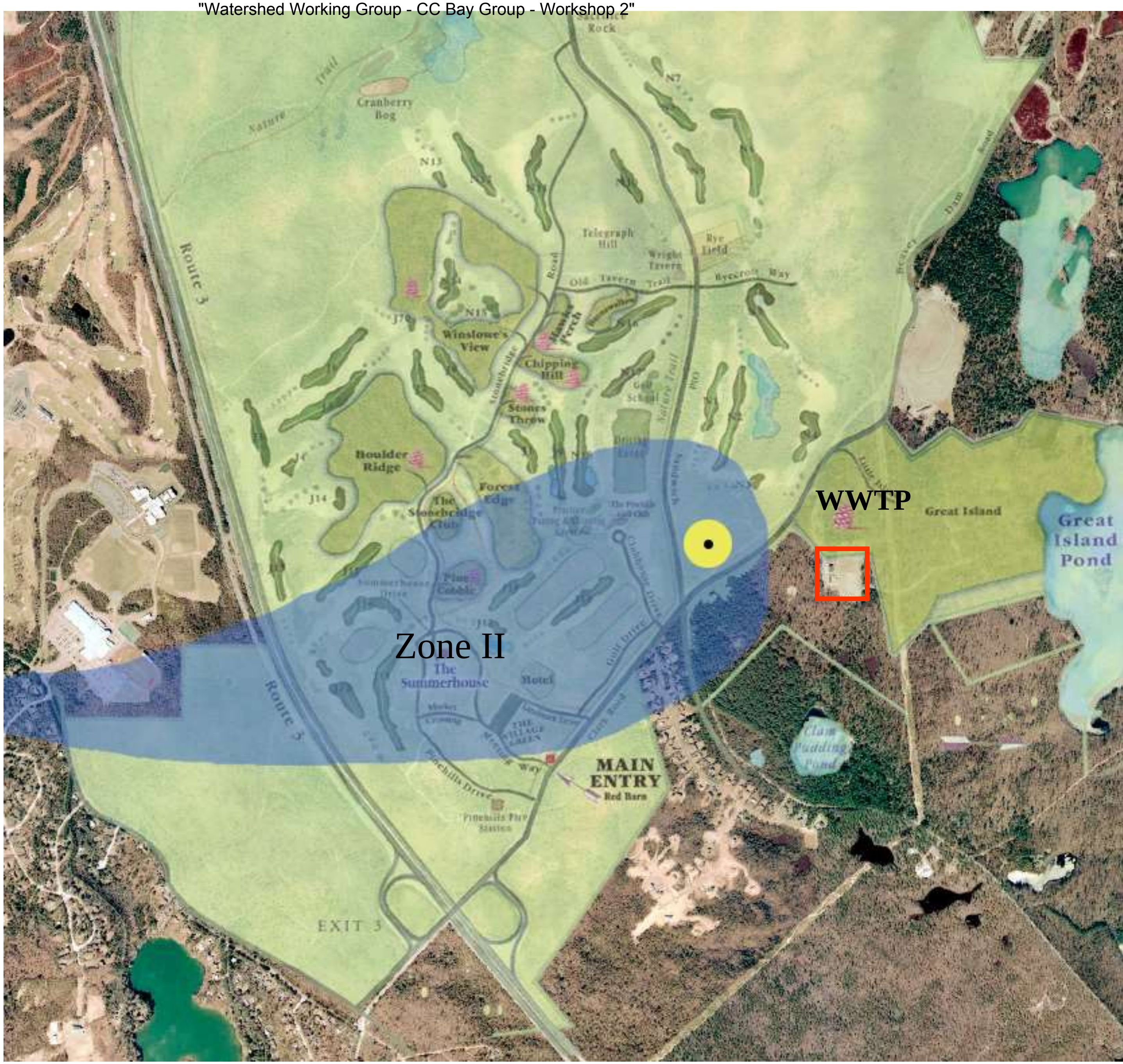

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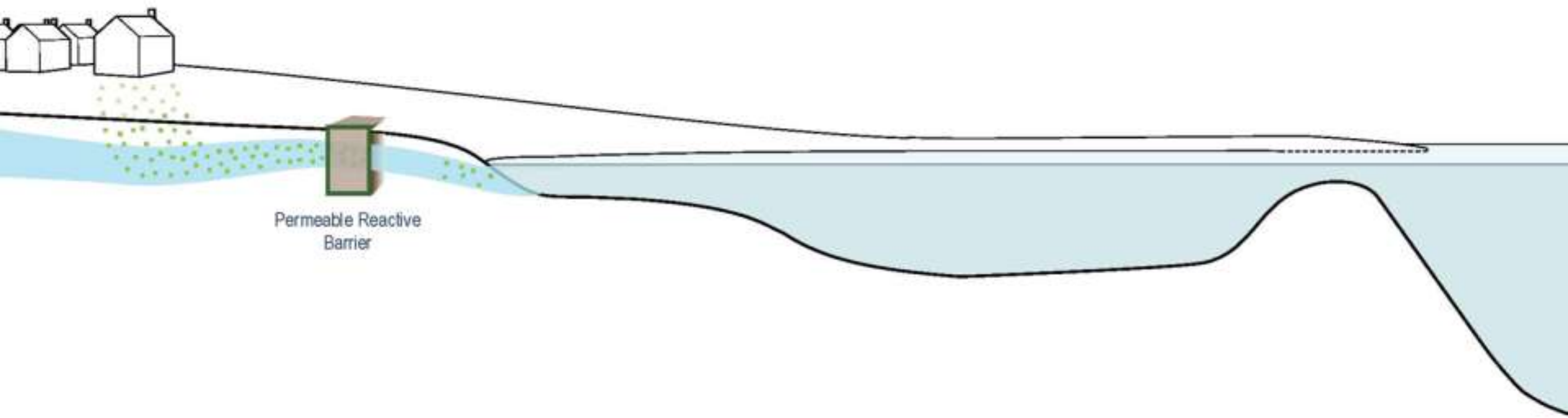
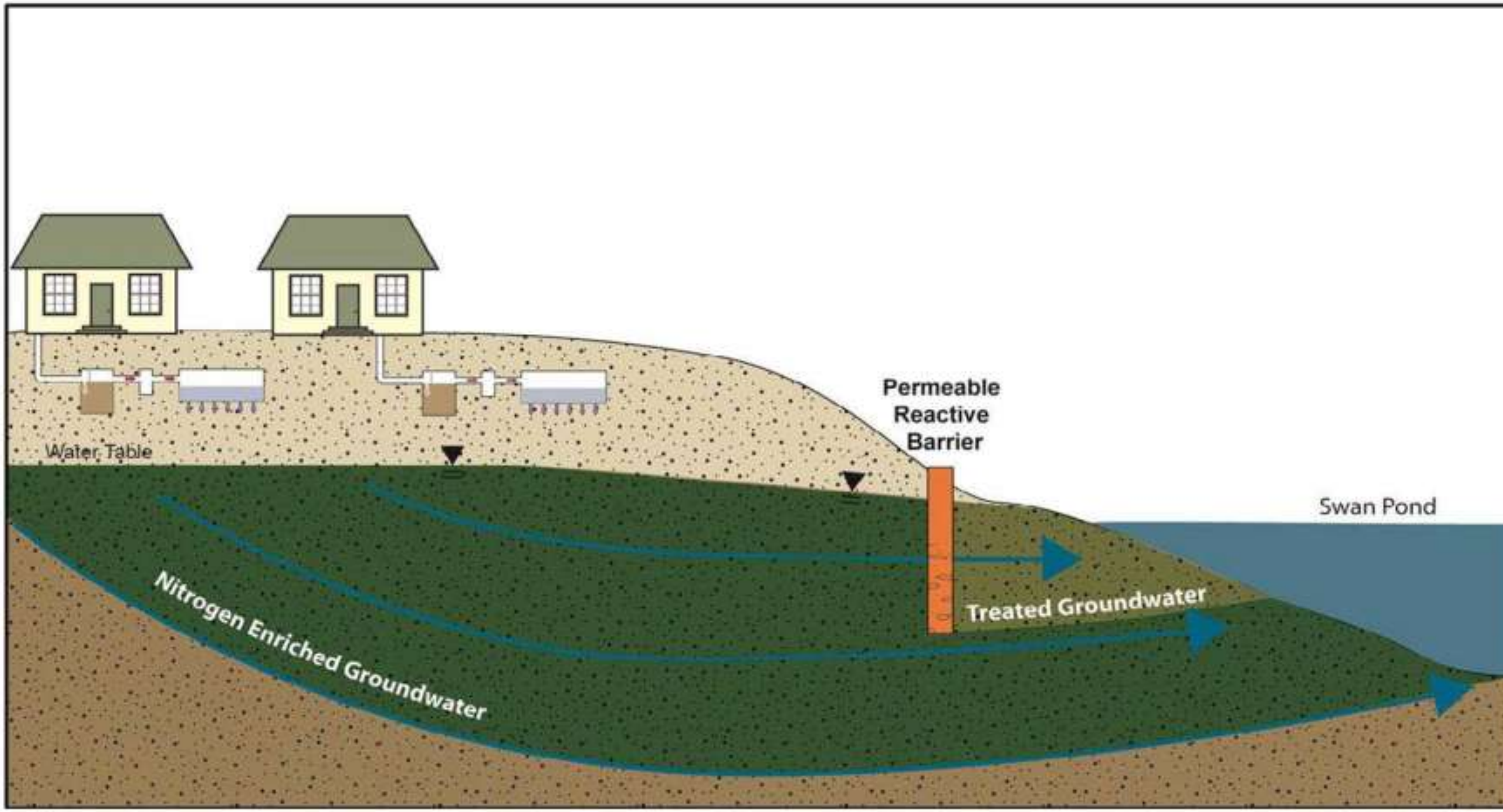


Scale: SITE / NEIGHBORHOOD / WATERSHED
Target: EXISTING WATER BODIES

Permeable Reactive Barrier

PRB



Precedent: PRB
Source: Horsley Witten Group Inc.

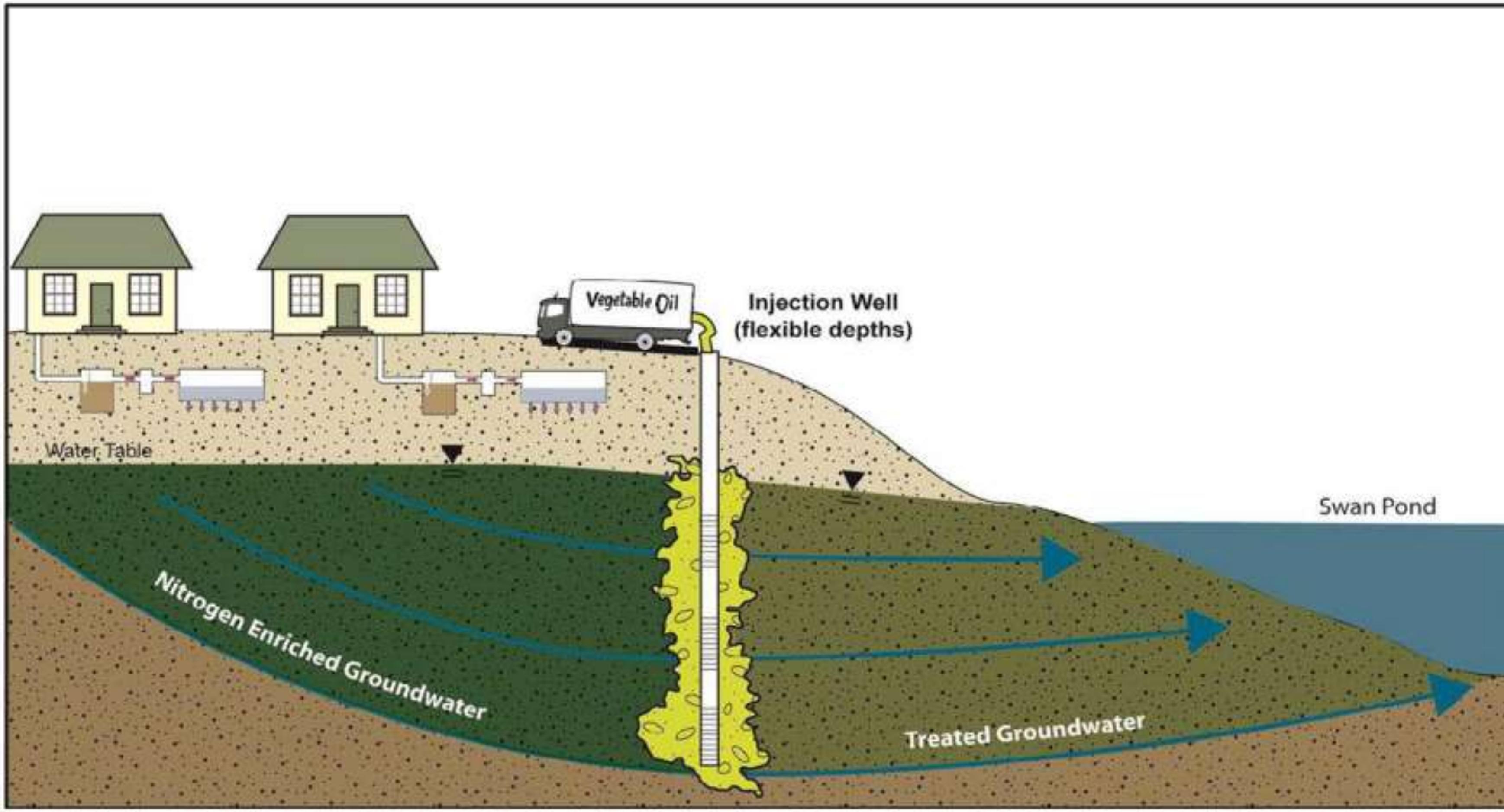
Permeable Reactive Barrier

PRB

Precedent: Falmouth PRB
Source: Mike Domenica

Permeable Reactive Barrier

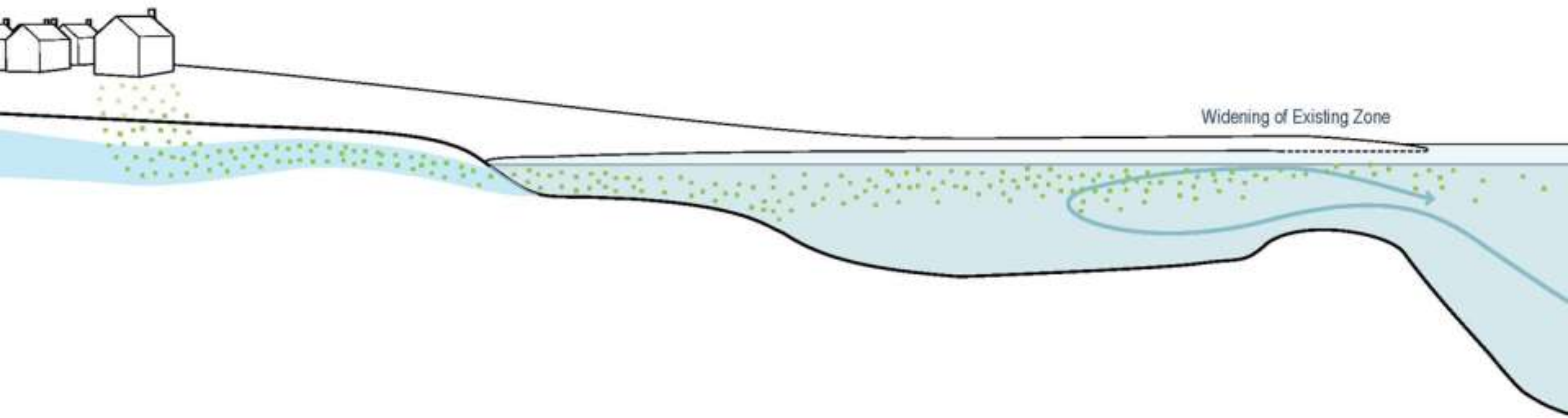
PRB



Precedent: PRB
Source: Horsley Witten Group Inc.

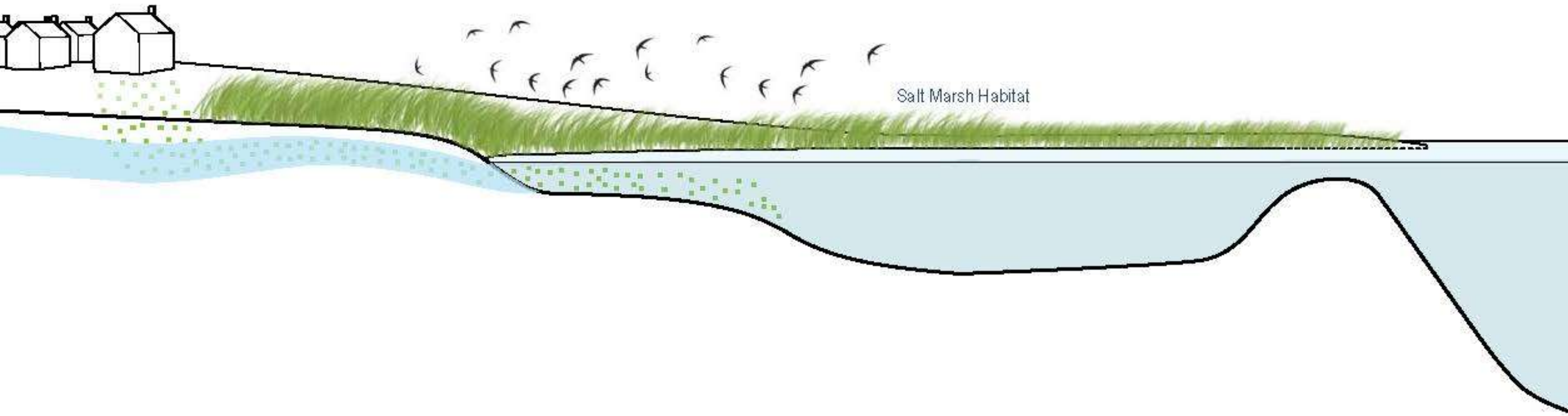
Permeable Reactive Barrier

PRB



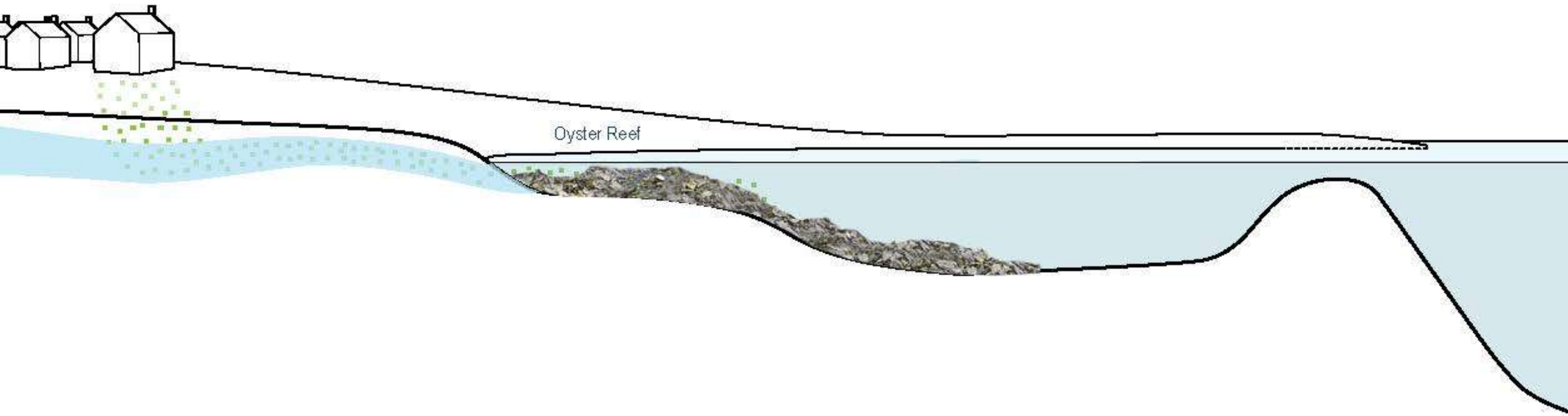
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Inlet and Culvert Widening



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Salt Marsh Habitat Restoration



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

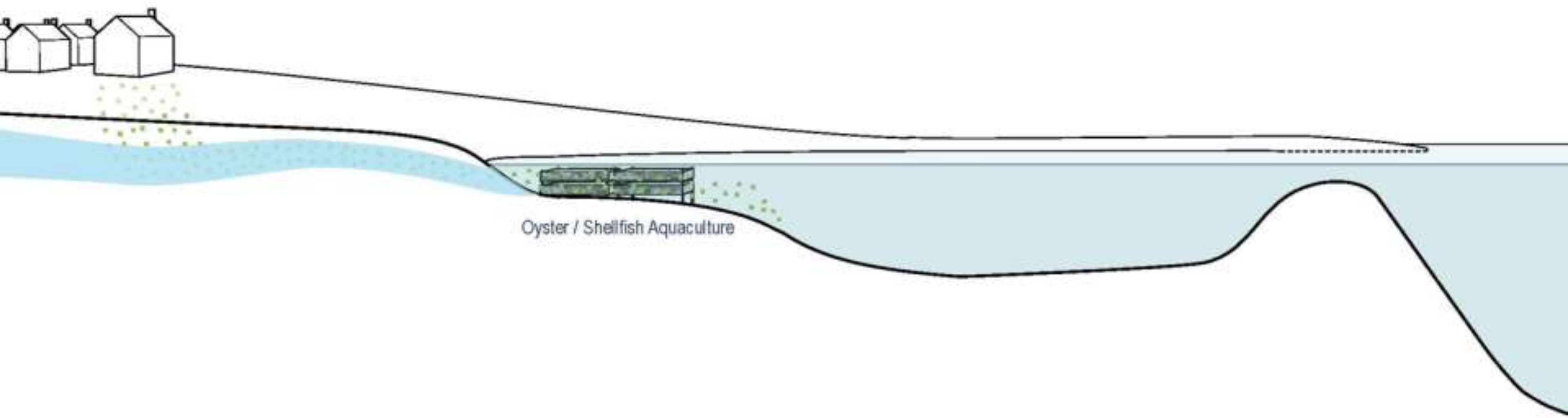
Shellfish Habitat Restoration

Precedent: Wellfleet Oyster Restoration Project
Source: Anamarija Francik

Shellfish Habitat Restoration

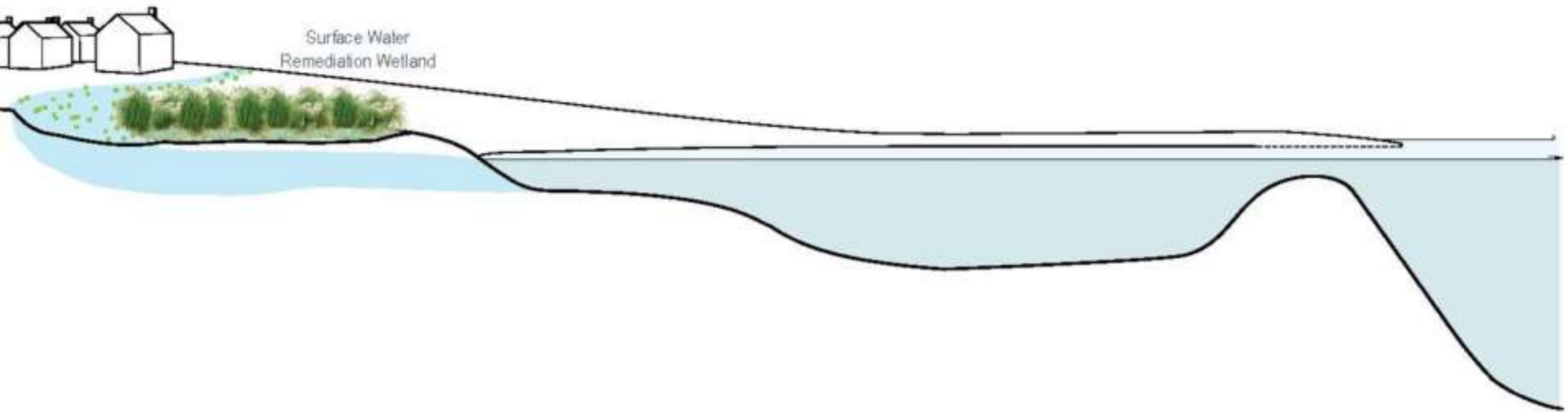
Precedent: Wellfleet Oyster Restoration Project
Source: Anamarija Francik

Shellfish Habitat Restoration



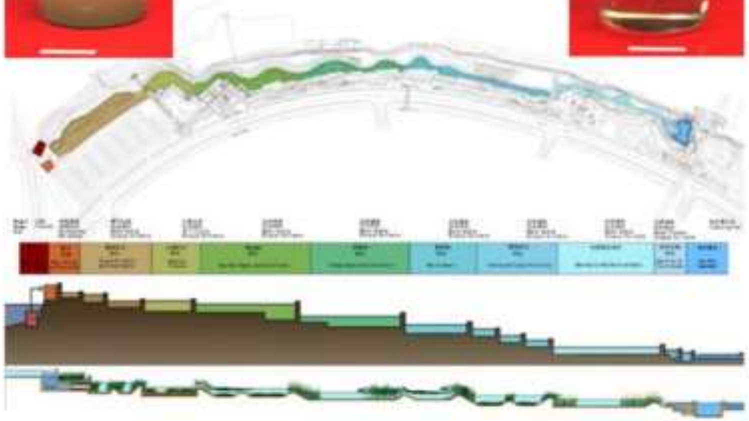
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Aquaculture / Shellfish Farming



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

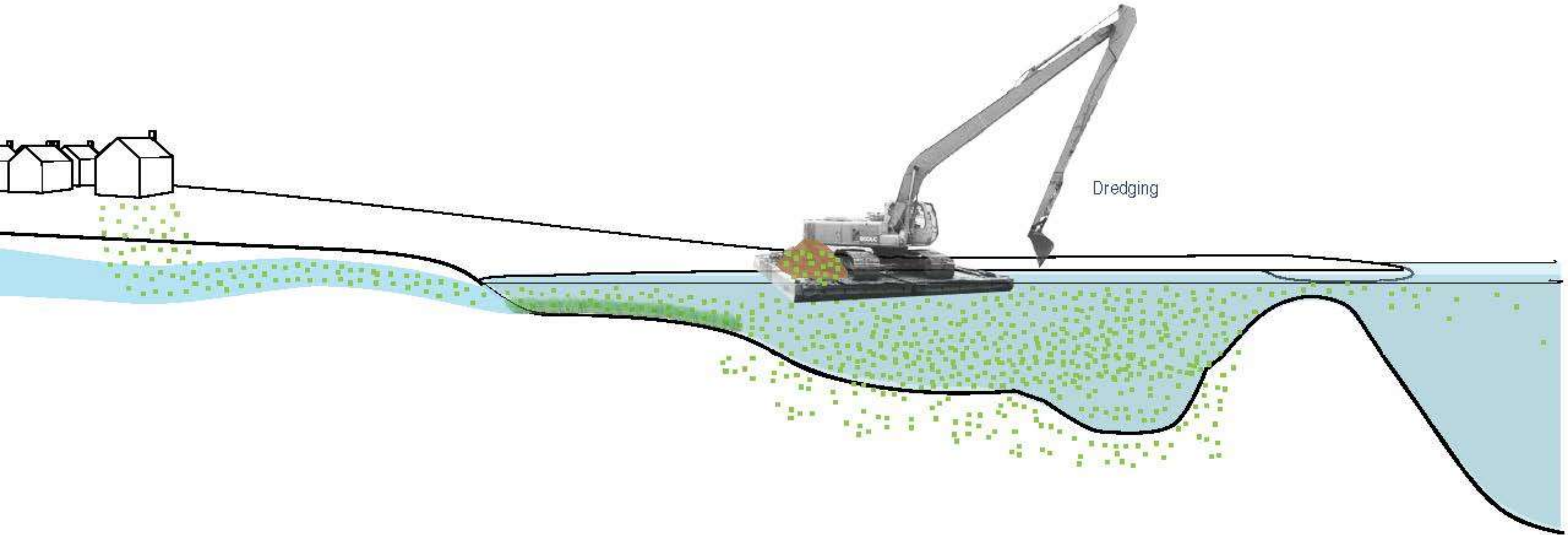
Surface Water
Remediation Wetlands



Precedent: Shanghai Houton Park

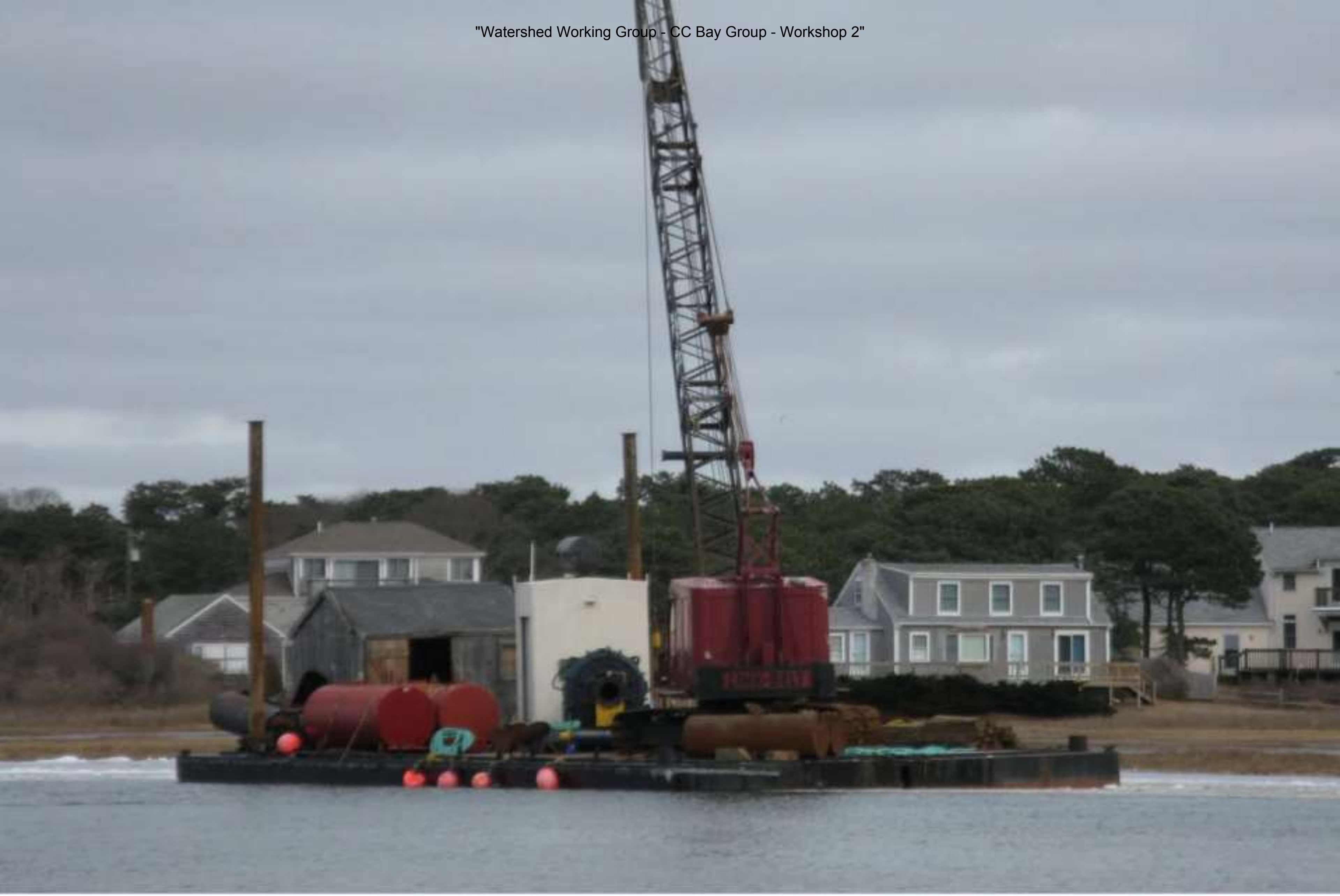
Source: Turenscape

Surface Water Remediation Wetlands



Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Pond and Estuary Dredging



Precedent: Pond and Estuary Dredging - Dennis, MA

Source: Cape Cod Times

Solutions: Cape-Wide

Site Scale | Neighborhood | Watershed | Cape-Wide

Compact Development

Remediation of Existing Development

Transfer of Development Rights

Fertilizer Management

Stormwater BMPs

Standard Title 5 Systems

Cluster & Satellite Treatment Systems

Conventional Treatment

I/A Title 5 Systems

STEP/STEG Collection

Advanced Treatment

I/A Enhanced Systems

Wastewater Collection Systems

Toilets: Urine Diverting

Effluent Disposal Systems

Toilets: Composting

Constructed Wetlands: Surface Flow

Toilets: Packaging

Constructed Wetlands: Subsurface Flow

Stormwater: Bioretention / Soil Media Filters

Effluent Disposal: Out of Watershed/Ocean Outfall

Stormwater: Wetlands

Phytoirrigation

Eco-Machines & Living Machines

Phytobuffers

Fertigation Wells

Permeable Reactive Barrier

Shellfish and Salt Marsh Habitat Restoration

Aquaculture/Shellfish Farming

Inlet / Culvert Widening

Pond and Estuary Dredging

Surface Water Remediation Wetlands

Scale: CAPE-WIDE
Target: REGULATORY

Compact Development

Scale: CAPE-WIDE
Target: REGULATORY

Fertilizer Management

N+P+K
MGMT

Scale: CAPE-WIDE
Target: REGULATORY

Remediation of Existing Development

Scale: CAPE-WIDE
Target: REGULATORY

Transfer of Development Rights

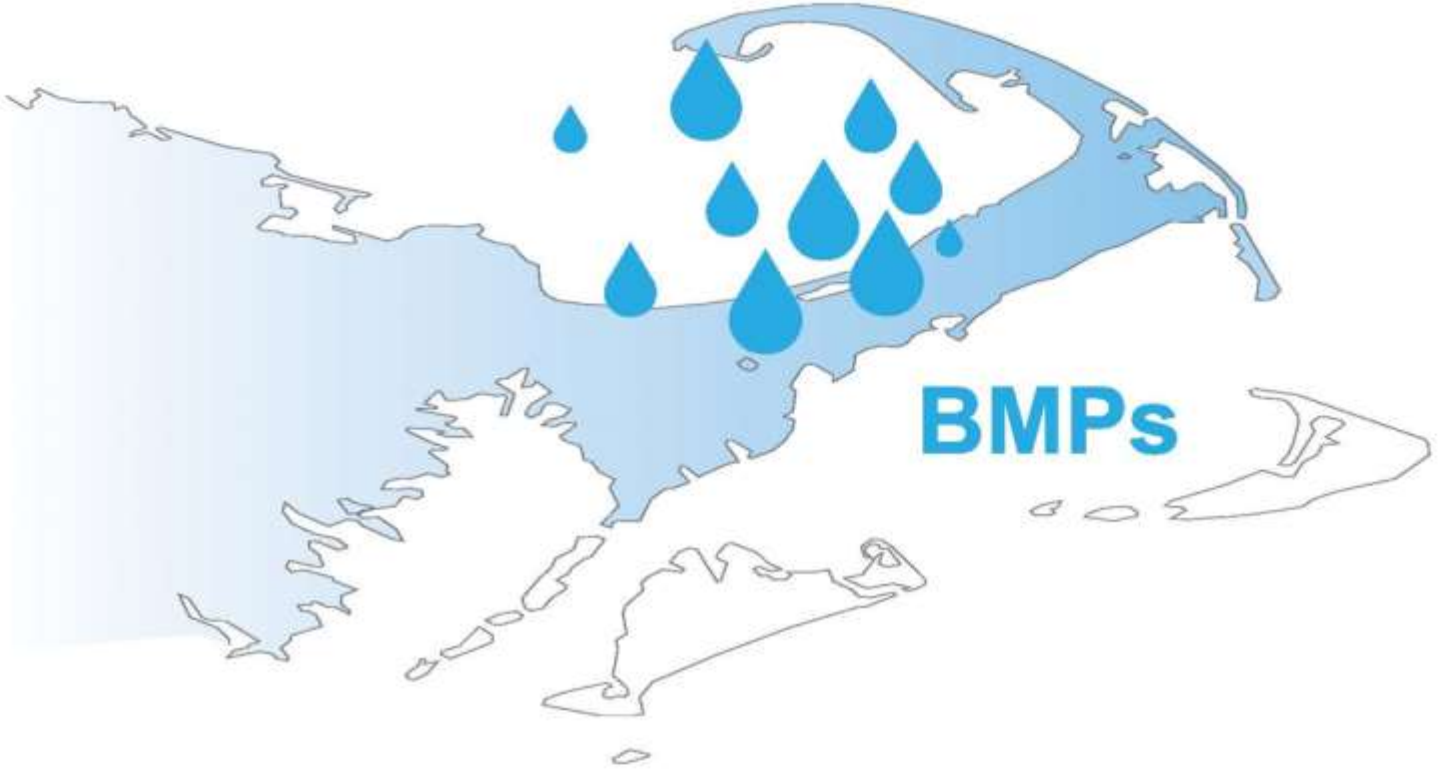
TDR

Transfer of Developments Rights
The Concept

Owner of "sending" parcel sells development rights in exchange for permanent conservation easement.

Owner of "receiving" parcel buys development rights to build at densities higher than allowed under base zoning.

Source: Massachusetts Smart Growth Toolkit



Scale: CAPE-WIDE
Target: REGULATORY

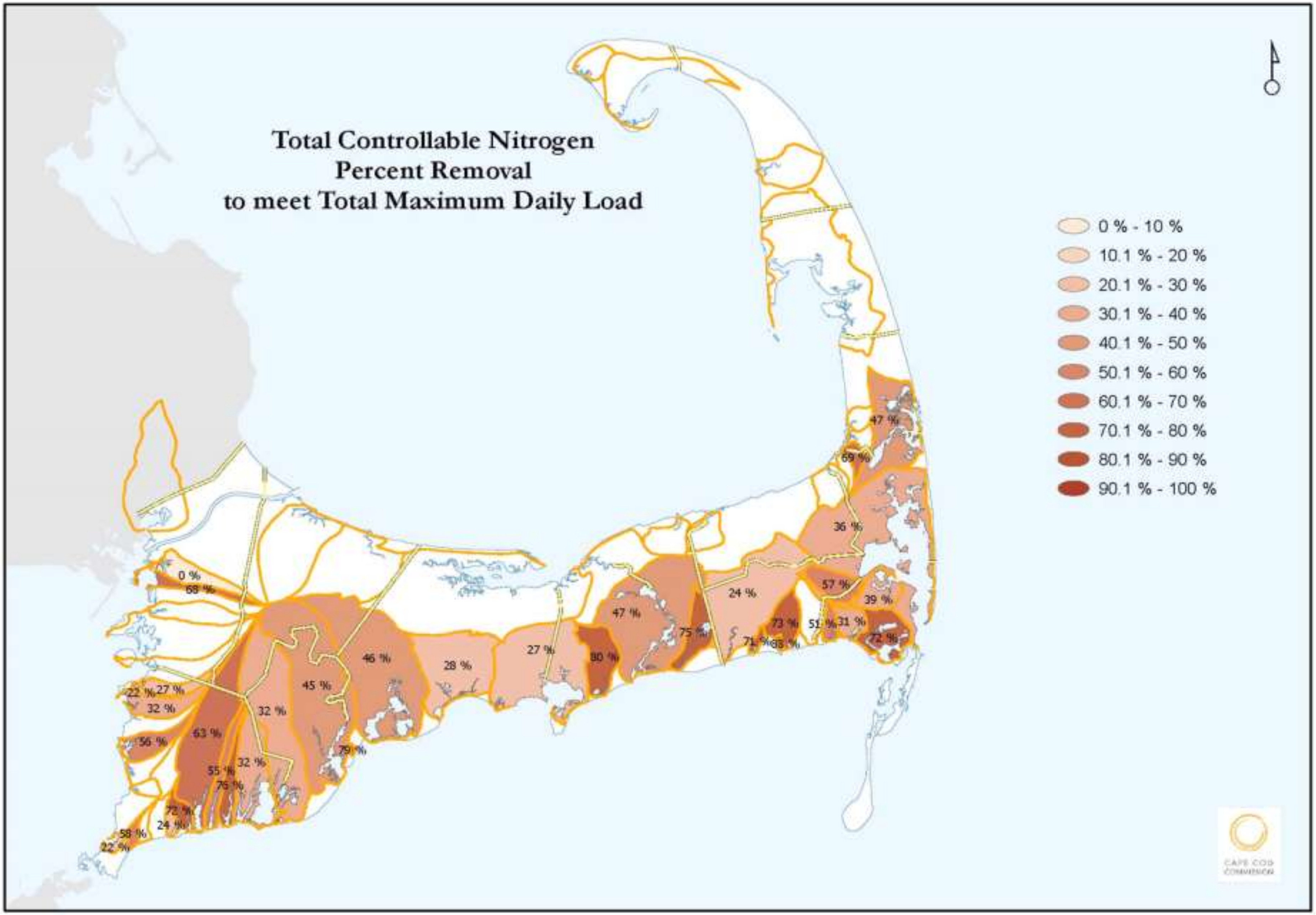
Stormwater BMPs

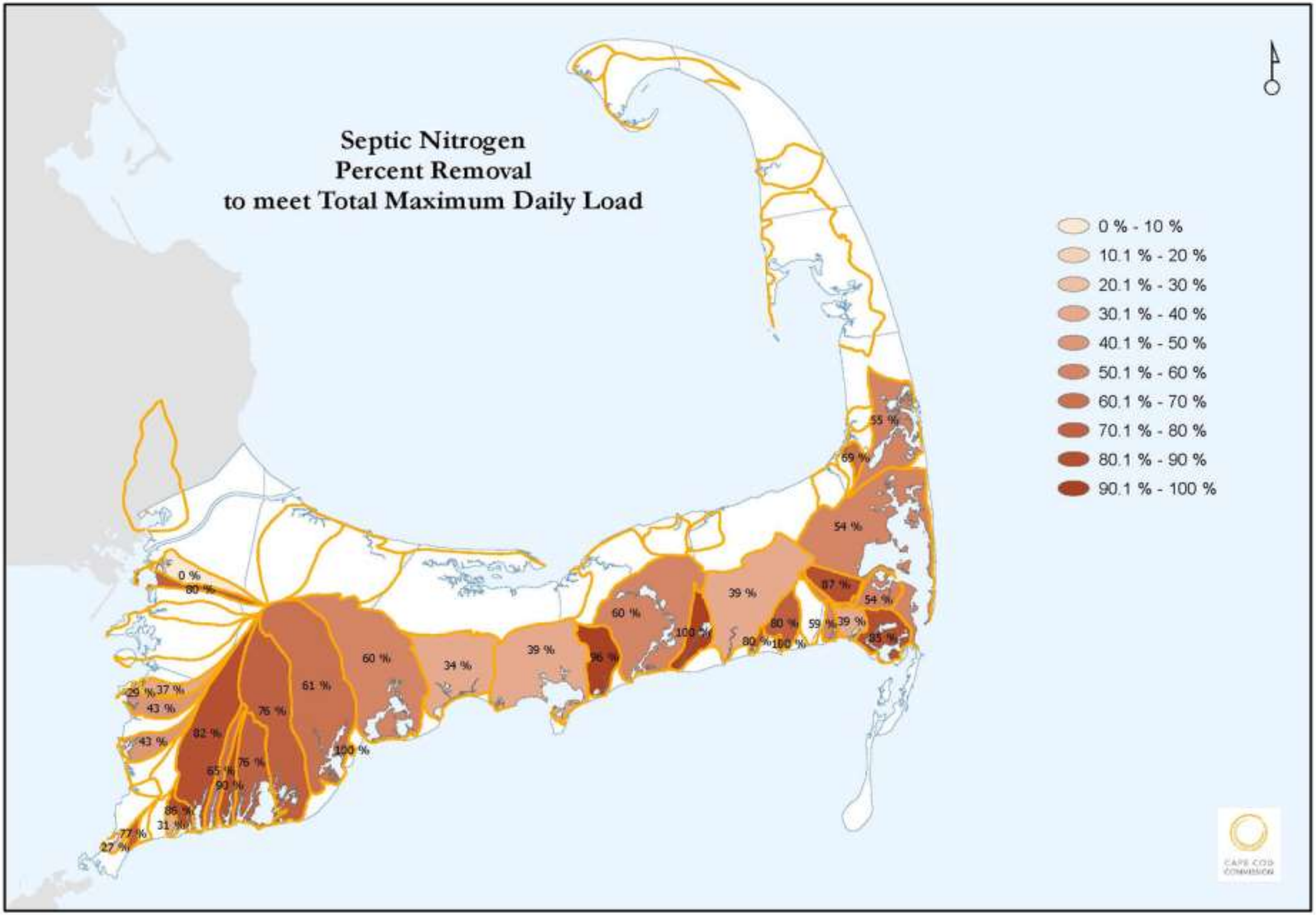
Town Consideration of Alternative Technologies & Approaches

Wellfleet-	*Coastal habitat restoration & aquaculture*
Mashpee-	*Aquaculture & Expanding Existing Systems*
Brewster-	*PRB & Bioswales*
Orleans-	*Fertilizer Control By-Law*
Harwich &- Chatham	*Muddy Creek & Cold Brook Natural Attenuation*
Falmouth-	*Aquaculture* *Inlet Widening* *Eco-Toilet Demonstration Project* *PRBs* *Stormwater Management (Little Pond Watershed)* *Fertilizer Control By-Law* *Subsurface Nitrogen Removal Septic Systems*

"Watershed Working Group - CC Bay Group - Workshop 2"

"Watershed Working Group - CC Bay Group - Workshop 2"


Total Controllable Nitrogen
Percent Removal
to meet Total Maximum Daily Load
0 % - 10 %
10.1 % - 20 %
20.1 % - 30 %
30.1 % - 40 %
40.1 % - 50 %
50.1 % - 60 %
60.1 % - 70 %
70.1 % - 80 %
80.1 % - 90 %
90.1 % - 100 %
CAPE COD COMMISSION


Septic Nitrogen
Percent Removal
to meet Total Maximum Daily Load
0 % - 10 %
10.1 % - 20 %
20.1 % - 30 %
30.1 % - 40 %
40.1 % - 50 %
50.1 % - 60 %
60.1 % - 70 %
70.1 % - 80 %
80.1 % - 90 %
90.1 % - 100 %
0 %
80 %
29 %
37 %
43 %
43 %
82 %
76 %
61 %
60 %
34 %
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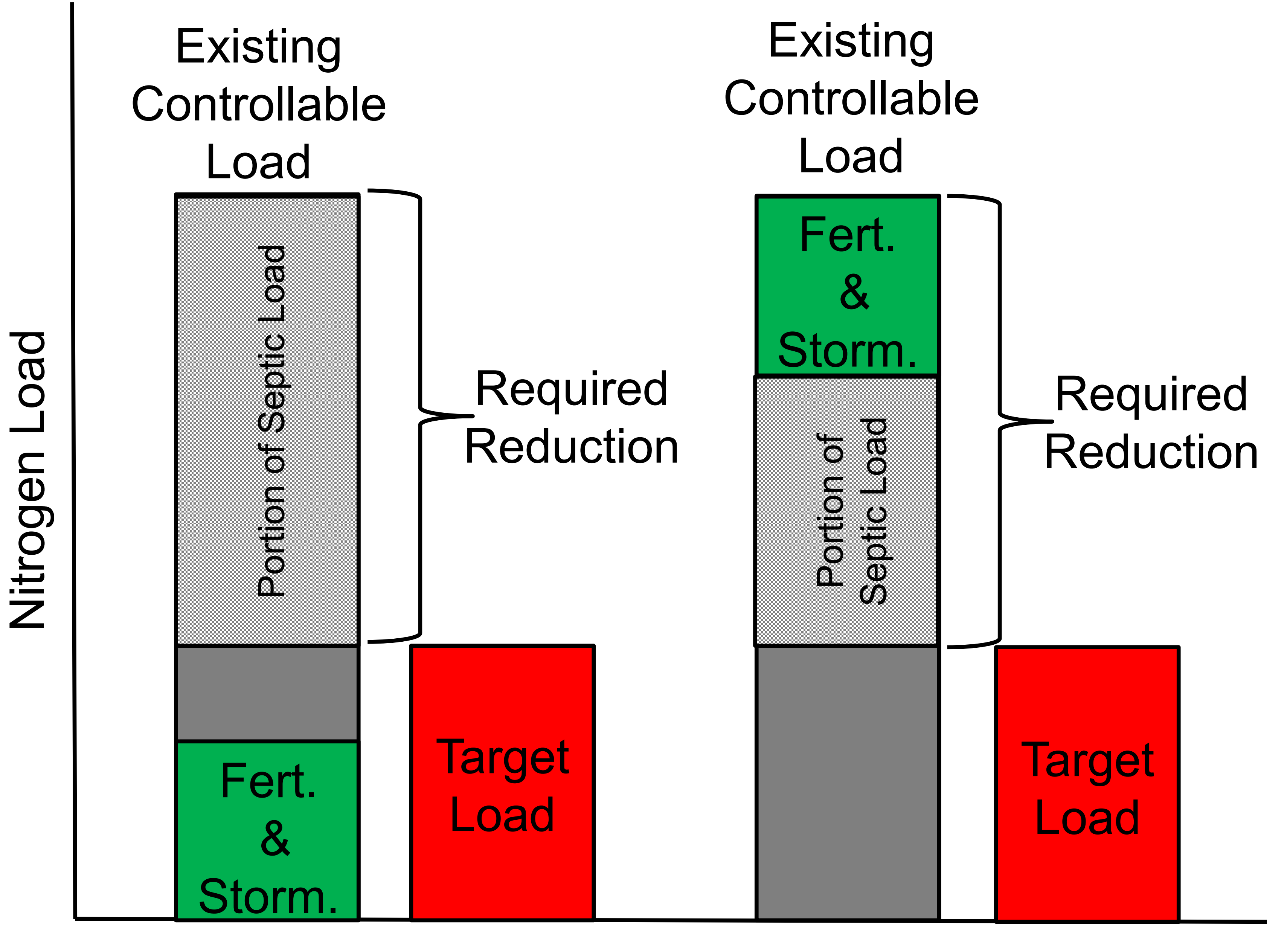
90 %
76 %
100 %
86 %
31 %
77 %
27 %
CAPE COD COMMISSION


Nitrogen Load
Existing Controllable Load
Portion of Septic Load
Fert. & Storm.
Required Reduction
Target Load
Existing Controllable Load
Fert. & Storm.
Portion of Septic Load
Required Reduction
Target Load

"Watershed Working Group - CC Bay Group - Workshop 2"

Problem Solving Approach

Wastewater | Existing Water Bodies | Regulatory

1 Targets/Reduction Goals

Present Load: X kg/day − **Target:** Y kg/day = **Reduction Required:** N kg/day

2 Other Wastewater Management Needs

A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management

3 Low Barrier to Implementation

A. Fertilizer Management
B. Stormwater Mitigation

4 Watershed/Embayment Options

A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture

5 Alternative On-Site Options

A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems

6 Priority Collection/High-Density Areas

A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones

7 Supplemental Sewering

Triple Bottom Line

Impacts of Technologies and Approaches

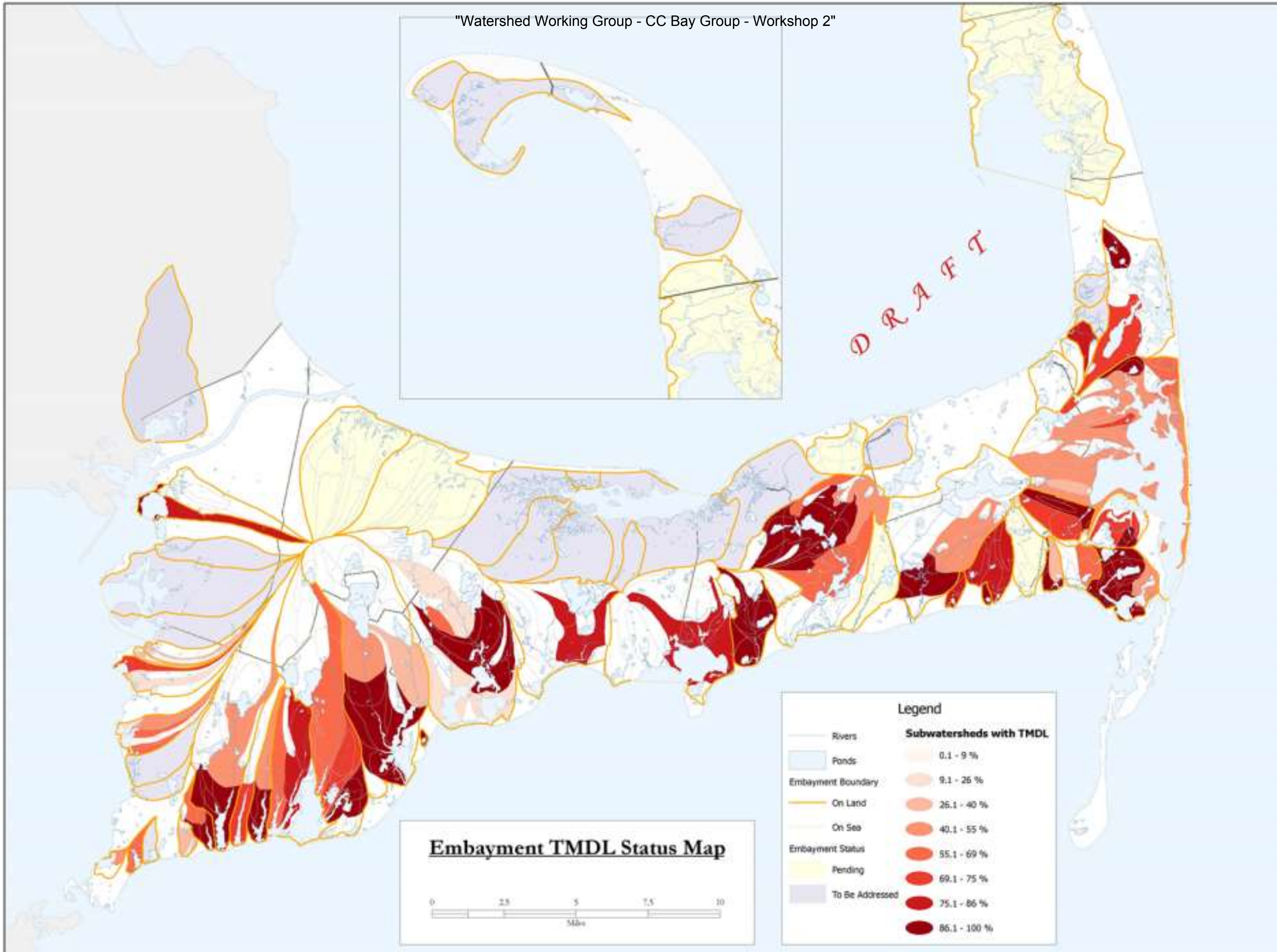
Environmental

Economic

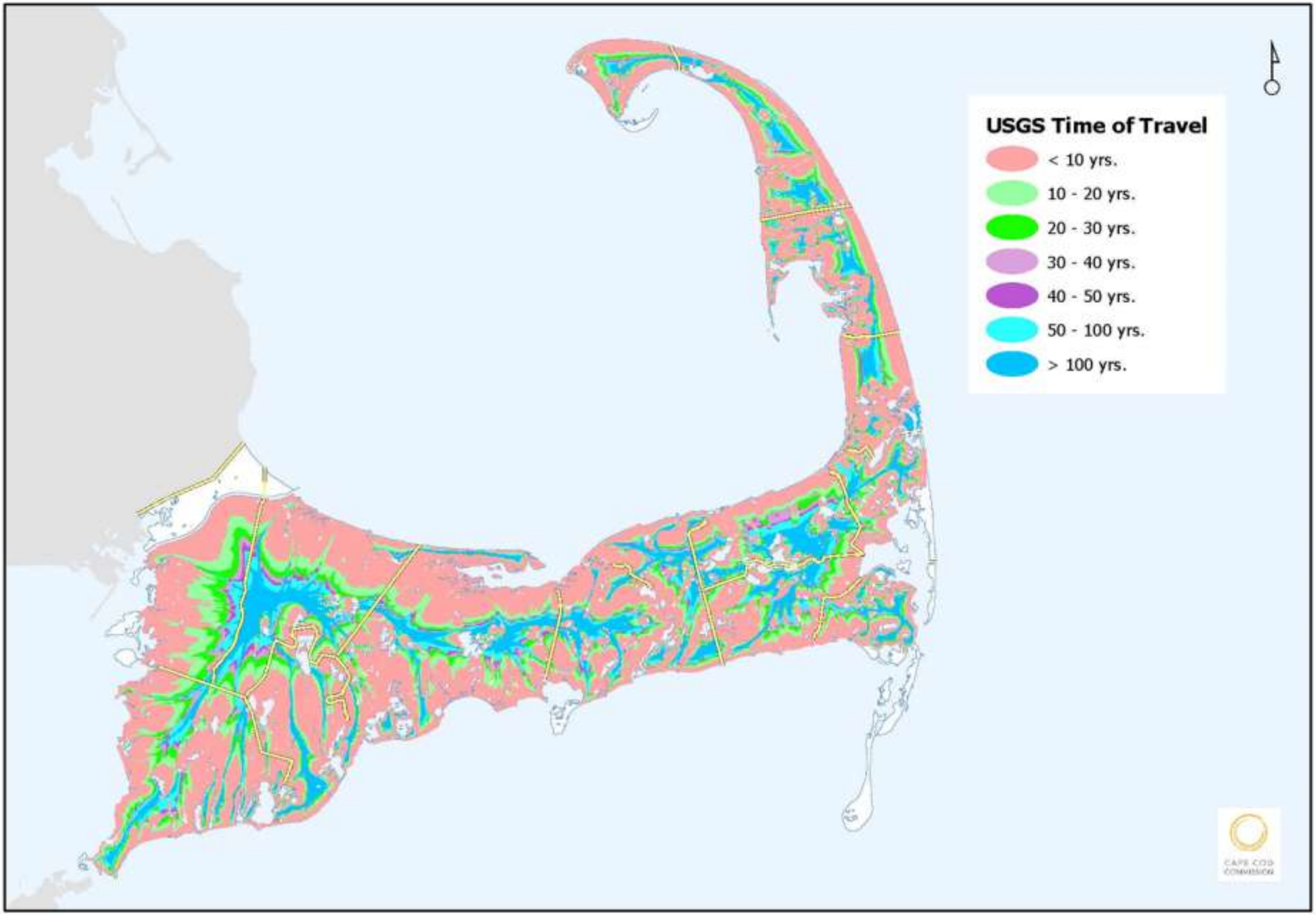
Social

Technology Selection: Process and Principles

- 100% septic removal subwatershed
- Scale: On-Site vs. Collection System vs. Natural System
- Nutrient intervention and time of travel
- Permitting Status
- Land use and Impacts of Growth


"Watershed Working Group - CC Bay Group - Workshop 2"
D R A F T
Embayment TMDL Status Map
0
2.5
5
7.5
10
Miles
Legend
Rivers
Ponds
Embayment Boundary
On Land
On Sea
Embayment Status
Pending
To Be Addressed
Subwatersheds with TMDL
0.1 - 9 %
9.1 - 26 %
26.1 - 40 %
40.1 - 55 %
55.1 - 69 %
69.1 - 75 %
75.1 - 86 %
86.1 - 100 %

"Watershed Working Group - CC Bay Group - Workshop 2"



Preparing for Meeting 3 and Beyond

- Review tools and alternatives analysis approach
- Evaluating scenarios for meeting water quality goals
- Attend the November 13th meeting:

6:00
Cape Cod Museum of Art
Dennis, MA

Cape Cod 208 Area Water Quality Planning
Cape Cod Bay Watershed Working Group

Meeting Two
Tuesday, November 5, 2013
8:30 am- 12:30 pm
Cape Cod Commission, 3225 Main Street
Barnstable, MA 02630

Draft Meeting Summary Prepared by the Consensus Building Institute

I. ACTION ITEMS

Working Group

- Next meeting:
  Meeting Three
  Monday, December 9, 2013
  8:30AM -12:30PM
  Cape Cod Commission, 3225 Main Street, Barnstable, MA 02630
- Send Carri any additional comments on Meeting One Summary
- Continue to prepare thoughts about which technologies/approaches they would like to learn more about for application in the watershed. Different scenarios and options will be discussed during Meeting Three.

Consensus Building Institute

- Finalize Meeting One summary
- Draft and solicit feedback from Working Group on Meeting Two summary

Cape Cod Commission

- Share Technology Matrix with Working Groups
- Share updated Chronologies with Working Groups

II. WELCOME, REVIEW 208 GOALS AND PROCESS AND THE GOALS OF MEETING

Ms. Erin Perry, Special Projects Coordinator at the Cape Cod Commission, welcomed participants and offered an overview of the 208 Update stakeholder process.[1] In July, public meetings were held across the Cape to present the 208 Plan Update goals, work plan, and participant roles. Public meetings were also held in August to present information on the affordability and financing of the updated comprehensive 208 Plan. The first meetings of the eleven Watershed Working Groups were held in September and focused on baseline conditions in each of the watersheds. The second meetings of the Watershed Working Groups will be held in October and early November and are focused on exploring technology options and

[1] The PowerPoint Presentation made at this meeting is available at: http://watersheds.capecodcommission.org/index.php/watersheds/mid-cape/cape-cod-bay-group

approaches. The third meetings of the Watershed Working Groups will be held in December and focus on evaluating watershed scenarios which will be informed by Working Groups' discussions about baseline conditions, priority areas, and technology options/approaches. This conversation will also be informed by information shared in the Technology Matrix, which was developed by the Cape Cod Commission with technical input from the Technology Panel. The Technology Matrix builds on the information presented in the Technology Fact Sheets, which Working Group members reviewed in advance of the meeting.[2] Once the Cape Cod Commission finalizes it, the Technology Matrix will be shared with Working Group Members.

Ms. Perry shared 208 Plan team's progress since Meeting One, which includes:

- Meeting materials distributed to stakeholders and available at http://watersheds.capecodcommission.org
- GIS data layers accessible at: http://watersheds.capecodcommission.org
- Chronologies are being updated and will be made available soon

Ms. Perry also shared that the second round of Cape-2-O game launched on October 22. She noted that over 400 people registered for the first round of the Cape-2-O game and encouraged Working Group members to participate in the interactive, online game which provides valuable education and input to the Cape Cod Commission.

Ms. Perry announced that there will also be a Cape Cod wide event on November 13 at the Cape Cod Center for the Arts in Dennis. Participants from across the eleven Watershed Working Groups and the public are invited to attend the event which will include: Wrap up of Cape-2-O: ur in charge!; a summary of planning process to date; and discussion of the stakeholder role in the second 6 months of the 208 planning process.

Ms. Perry welcomed participants and reviewed the goal of the meeting:

- To develop a shared understanding of the potential technologies and approaches identified to date, and the benefits and limitations of each; to explore the environmental, economic, and community impacts of a range of categories of solutions; and to identify priorities and considerations for applying technologies and approaches to remediate water quality impairments in your watershed.

During the September meeting, nearly all the Watershed Working Groups had robust discussions about the buildout the Commission plans to use for the 208 Plan Update. The Commission will convene meetings in November to further discuss the buildout with the town representatives.[3]

Working group member asked the following questions about the 208 Plan Update process (italicized).

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[2] Technology Fact Sheets are available at: http://watersheds.capecodcommission.org/index.php/watersheds/mid-cape/cape-cod-bay-group

[3] This was not stated in the meeting but is included for general information.

- *Will the municipalities have influence over who pays for what or will the Cape Cod Commission or another authority order the municipalities to spend the money? Who will pay for this?* We do not know yet how this will work; but we hope the updated 208 plan will help attract funds. We also hope to identify ways to spread the cost and reduce the overall burden on the municipalities. The Cape Cod Commission does not have the authority to make municipalities do anything.
- *A member expressed hope that this process to review the various technologies will result in DEP's willingness to accept innovative solutions.*

Ms. Carri Hulet, the facilitator from the Consensus Building Institute, reviewed the agenda and led introductions. A participant list is found in Appendix A. She reminded the working group that they would also need to establish a clear water quality goal for the watershed since no MEP targets for nitrogen had ben established for the watersheds in this area.

III. RANGE OF POSSIBLE SOLUTIONS

Mr. Scott Horsley led the discussion of the range of possible solutions. As Working Groups learn more and consider the pros and cons of the technologies and approaches, he encouraged participants keep in mind that:

- The Cape Cod Commission has engaged in a comprehensive analysis of nutrient control technologies and approaches. This analysis is distilled into: the Technology Fact Sheets, which present various information on the technologies being considered; the Technology Matrix, which includes additional information on site requirements, construction, project and operation and maintenance costs, reference information, and regulatory comments; and ongoing input from stakeholders on the public acceptance of technology options and approaches.
- Not all of the technologies and approaches will be applicable to Cape Cod.
- Some technologies are so promising that we should identify them for demonstration and pilot projects.
- Meeting 3 will focus on hands-on problem solving in each watershed to meet target load reductions. However, target load reductions are not established for the watersheds of the Cape Cod Bay Working Group.
- Certain technologies or approaches will be effective at preventing nutrients from entering the water body. Others will be effective at reducing or remediating nutrients that are already in the groundwater or water body.
- Regulatory programs can address nutrient controls for both existing development and future development.

Mr. Horsley offered a brief overview of the technologies and approaches. The following section briefly describes each technology. Participants' questions and comments about the technologies are also discussed below (in *italics)*:

Site level technologies/approaches

Standard Title V System*:* This is a standard septic system that consists of a septic tank and soil adsorption system (leaching field). The system was primarily designed to address public health concerns related to waste in drinking water (e.g. coliform bacteria); they were not designed to remove nutrients (e.g. nitrogen).

I/A title V System: Innovative/Alternative (I/A) on-site nutrient reducing systems typically consist of standard septic system components augmented to remove more nutrients than a standard Title 5. I/A systems refer to a class of systems intended to be designed as recirculating sand filter (RSF) equivalents by meeting the same treatment limits in a smaller footprint. The DEP permits more than 20 technologies on general, provisional, and pilot basis. George Huefelder's (Barnstable County Department of Health and Environment) investigation of these technologies shows that performance is highly variable.

- *The slide on the standard title V system indicates a removal rate of 34%. The Cape Cod Commission may want to clarify this figure so people do not think that they will meet water quality standards if they achieve 34% nitrogen reduction. A correction should be applied if thinking about the percentage removal needed from each watershed.*

Ecotoilets:

Urine Diverting Toilets: Urine diversion systems send urine into a holding tank where the urine is stored and periodically collected by a servicing company. The servicing company empties the tank for disposal or recycling such as conversion to a fertilizer. Through these means, the nitrogen may be removed from the watershed. With urine diverting toilets, the remainder of the human waste and all other water uses (sink and shower) continue to go to the septic system. (Case example, Falmouth, MA).

- *With urine diverting toilets, one could link all bathrooms together with pipes. But with composting, a separate toilet system is needed for each bathroom, correct?* Mr. Horsley affirmed the member's statement and said that composting toilets may present architectural challenges.
- *Would it be feasible to install the urine diverter on the other side of the septic tank? Is it feasible to separate the urine from the solid waste after passing through the septic tank?* A group member said it is not feasible because the volume of grey water exiting the system at the same point would overwhelm the urine tank.
- *Australians use urine diversion. There is field aerator technology that can inject it into turf as a nutrient. This method can get rid of 90% of nutrients.* Mr. Horsley said the nutrient recovery and reuse idea is an interesting option
- *Has there been any work done in the treatment and removal of pharmaceuticals in urine diversion technologies?* Mr. Horsley was unaware of any urine diversion technologies that address removal of pharmaceuticals.
- Ms. Hulet said a stakeholder asked in the survey how often urine collection tanks need to be pumped. Mr. Horsley estimated it would need to be pumped once per year, depending on the size of the tank.

- *From a behavior change standpoint, it would be challenging or almost impossible to get people accustomed to use different toilets (or different spaces within toilets) for different kinds of waste.*

Composting toilets: A toilet system, which separates human waste from shower, sink, and other household water uses. The composting toilets use no or minimal water. The human waste captured by the composting toilets is decomposed and turned into compost. The compost generated is removed from the site and nutrients can be recycled. Composting toilets require the replacement of existing toilet(s) and room in the basement for a container to capture and compost the human waste. Household water use (sink and shower uses) continue to flow to the septic system. (Case example, Falmouth, MA).

Packaging toilets: A packaging toilet encapsulates human waste in a durable material for removal from the site. The package is stored beneath the toilet and removed and taken away when full. The nutrients can be recycled by the servicing company that picks up the packages.

Stormwater bioretention: Bioretention systems utilize natural plant and soil functions to capture and treat stormwater runoff for a variety of contaminants including nutrients. A typical system consists of an underdrain/gravel layer, a layer of bioretention soil mix (a mix of sand, compost, woodchips and loam), and a surface layer containing appropriate plantings. The treated water can be discharged into a water body or used for open space irrigation after treatment. The reclaimed water can also be discharged into a subsurface infiltration system for discharge to the groundwater. (Case example, Portland, OR).

Group members made the following comments and questions about the site level technologies and approaches:

- *How are seasonal variations factored into performance? For example, a rain garden with frozen ground in November is not as good at its job in the wintertime.* Mr. Horsley said research shows that nutrient removal declines in the winter, but the newer systems can achieve 40% removal year round due to root and soil based processes. Some of the I/A systems restart quicker than others after seasonal fluctuations.
- *If people are interested to learn more about composting systems, there is a program at Alchemy Farm in Falmouth and another program at the Green Center where composting toilets are set up in a room. It is open for the public.*

Neighborhood level technologies/approaches

Cluster and satellite treatment systems: A cluster or satellite system is a collection and treatment system treating wastewater flows from multiple properties.

- Ms. Hulet stated a question posed in the survey regarding cluster treatment systems: What factors affect the percentage of nitrogen and phosphorous removal, which vary from 55-90%? Mr. Horsley commented that the range of removal is very broad across some technologies and that the technologies with the tightest design also have the most accurate removal estimates. Pilot projects may be required to determine the percentage of nutrient removal on the Cape, if the DEP is to agree to provide credits for some of the technologies.

STEP/STEG collection: Septic Tank Effluent Pumping (STEP) and Septic Tank Effluent Gravity (STEG) systems convey liquid wastewater from on-site septic tanks to sewer systems; only the liquid component of the wastewater may be conveyed by pumps or by gravity.

Eco machines and living machines: Living or Eco-Machines are natural systems that treat septic tank effluent or primarily treated wastewater. In these systems, aeration and clarification chambers are combined with constructed wetlands to treat the influent. The wetlands are a series of chambers allowing for microbial communities to engage with and treat the wastewater. Plants are often suspended on racks with their roots systems doing the work. Solids removal is generally onsite, after which water is pumped through the gravel filled cells (similar to subsurface wetlands.) This process transfers more oxygen to the wastewater and completes the pollutant removal process. (Case example, South Burlington, VT).

- *There is an ecosystem in Weston Massachusetts, and dozens elsewhere outside of Massachusetts. Harwich had one as a pilot system but it is no longer in operation.*

Stormwater wetlands: Constructed wetlands provide aerobic chambers followed by subsurface anaerobic chambers that facilitate nitrification followed by denitrification, respectively. This process mimics that of natural systems coupled with engineering design guaranteeing residence time within a chamber containing anaerobic conditions.

- *These are permitted and promoted as stormwater policy. But the downside is the footprint requirement.*
- *There is an example of one of these in Cambridge near the Alewife T station.*

Watershed level technologies/approaches

Conventional treatment: A conventional wastewater treatment facility typically treats wastewater collected from homes and businesses. A groundwater discharge permit is required. Treatment generally results in less than 10 mg/L Nitrogen. Collection can be 50% or more of the cost of these systems. Density therefore is a huge key to this system.

Constructed wetlands: surface flow: After primary treatment in a septic tank or wastewater treatment facility or secondary treatment at a wastewater treatment facility, water is fed into a surface flow constructed wetland. Surface flow constructed wetlands closely mimic the ecosystem of a natural wetland by utilizing water loving plants to filter wastewater through their root zone, a planted medium, and open water zones. Surface flow wetlands are systems where open water is exposed much like in a natural marsh. The reclaimed water from the wetland can be discharged into a water body or used for open space irrigation after treatment as well as discharged into a leach field. (Case example, Albany, OR).

Constructed wetlands: subsurface flow: After primary treatment in a septic tank or wastewater treatment facility or secondary treatment at a wastewater treatment facility, wastewater is treated by pumping water slowly through subsurface gravel beds where it is filtered through plant root zones and soil media. Water flows 3-8" under the surface to prevent public exposure to wastewater and mosquito breeding. A combination of horizontal and vertical flow subsurface systems must be utilized to provide total nitrogen removal. This solution can also offer opportunities for recreation activities on land above the subsurface system. (Case example, Thailand).

Effluent disposal: out of watershed: Effluent disposal can take a variety of forms, including infiltration basins, a Soil Absorption System, Injection Wells or Wick Wells. These disposal methods place highly treated effluent back into groundwater. Effluent Transport out of the watershed has the advantage of removing the nitrogen load to another watershed. Transport to another watershed requires the receiving watershed to be able to accommodate the additional nitrogen load.

- Ms. Hulet said someone asked the following question in the survey: *What happens in regards to balancing the hydrology if effluent is moved from one watershed to another?* Mr. Horsley said the current systems already redistribute the water within and across systems.
- *Who has the legal authority to take wastewater from one watershed and move it to another?* Mr. Horsley said the DEP has this authority and exercises it at the basin level. But, since the Cape is considered one basin, there are not legal challenges to redistribute water.
- Mr. Horsley asked if the group might discuss transporting water from one watershed to another to take advantage of assimilative capacity. A member said this is the dilution is the solution approach, which only moves the problem from one location to another. Another member said it is worth discussing how it might work and the costs and benefits of it. Ms. Hulet said it seems as if the challenge would be deciding how to do cross jurisdictional distribution.

Effluent disposal: ocean outfall: Similar to out of watershed effluent disposal, highly treated effluent is transported out of the watershed and into the ocean. This solution requires a high level of regulatory oversight, but the solution is being considered because there is limited land availability for disposal on Cape Cod.

- *What is the impact of an ocean outfall on aquifer recharge?* Mr. Horsley commented that recharge is based on recharge rate and permeability of the sediments. If less water is entering, then the aquifer depletes and vice versa.
- *Is ocean outfall lawful in Massachusetts?* Yes, responded Mr. Horsley. *The Ocean Sanctuary Act was amended by the Ocean Management Act, which allow ocean outfalls. Ocean outfall regulations could be revisited through the Ocean Management Act review process. Is there anywhere else in state where ocean outfalls have been used?* Mr. Horsley said Essex, Manchester By the Sea, and Gloucester have outfalls.
- *How do outfalls compare in terms of cost*? Mr. Horsley said they are probably very site specific.

Phytoirrigation: After secondary treatment, wastewater treatment facility effluent is irrigated onto plants to remove nutrients and other contaminates. Fast growing poplar and willow trees are typically used. (Case example, Woodburn, OR).

- *There is an example of this in Sandwich, where effluent is used to fertigate rhododendrons.*
- *The Links at Bayberry Hills also use nutrient effluent for fertilization.*
- *Some of these technologies have been tried in places but are no longer used. For example, Canary grass was used in Yarmouth but not any more. Another member said the plant in Yarmouth was built much larger than it required and future growth did not occur as expected. The water from the plant was to be pumped to the water department and excess nitrogen was supposed to be applied to canary grass. But, it turned out there was not sufficient nitrogen coming from the plant to maintain growth of the canary grass. Some of the nitrogen effluent is now utilized on the golf course.*

Neighborhood or Watershed level technologies/approaches

Phytobuffers: Using trees with a deep root system to capture nutrients in the soil, particularly willows and poplars. Green plants with deep tap roots are planted as a buffer to intercept existing groundwater. The plants and their associated microorganisms reduce contamination in soils and ground water. Often phytohydraulics causes the groundwater plume to be redirected and pulled towards the plants. (Case example, Kavcee, WY).

Fertigation wells: Fertigation wells can capture nutrient enriched groundwater, typically from a wastewater treatment facility discharge, and recycle it back to irrigated and fertilized turf grass areas. These irrigated areas include golf courses, athletic fields and lawns. Fertigation can significantly reduce nutrient loads to downgradient surface waters while reducing fertilizer costs to the irrigated areas. (Case example, Plymouth, MA).

Permeable reactive barrier (PRB): A permeable reactive barrier (PRB) is an in-situ (installed within the aquifer) treatment zone designed to intercept nitrogen enriched groundwater. Through use of a carbon source, microbes in the groundwater uptake the nitrogen, denitrifying the groundwater. PRB systems typically use vertical trenches, sequences of bored columns or injection methods to introduce the carbon source into the groundwater to reduce the nitrogen load to an estuary, removing it from the watershed. The Cape Cod Commission is investigating the potential to install PRBs along roadways, which would avoid permitting issues associated with beaches and wetlands. (Case example, Falmouth, MA).

- *Can PRBs be set up to do capture both nitrogen and phosphorous or must you pick one or the other?* Mr. Horsley said he was uncertain but said different materials may be necessary to capture different nutrients.
- *A member noted that injection wells might allow injection of different materials on a periodic basis to capture different nutrients, and could perhaps be combined.*
- *Brewster started to look at this technology in two locations, one at a golf course and*

another closer to Pleasant Bay. The water table is sixty feet deep at the golf course, which presents added expense. Falmouth is discussing injection wells. In Brewster they also have a lot of ponds in various conditions, but they do not to have TMDLs. PRBs could be an interesting solution for phosphorous in Brewster.

<u>Inlet and culvert widening</u>: Re-engineering and reconstruction of bridge or culvert openings to increase the tidal flux through the culvert or inlet. This solution generally works better with a larger tidal range but could be feasible on both the Cape Cod Bay side (approximately nine feet tidal range) and Nantucket Sound side (approximately 3 feet of tidal range).

- This looks at increasing the flushing rate in the embayments, which in many cases would be restoring the flushing rate in the embayment. Larger culverts that present or than historical could be installed to increase flushing.
- *The new FEMA flood maps may present a large hurdle to this solution.*
- *In Dennis, the change in the flood plain delineation added six thousand more properties to the floodplain.*
- *If widening the culverts causes issues, why not just pump a specific number of gallons from up-estuary and shoot it out to the ocean as the tide goes out. This would help the nutrient laden waters pass out during appropriate times, and a greater quantity of ocean water would return with the tides.*

<u>Salt marsh habitat restoration</u>: Salt marsh is one of the most productive ecosystems in the world, surpassing rainforest in productivity per acre. Approximately 65% of historic salt marsh has been lost in MA. Salt marshes cycle and remove nitrogen as well as provide critical habitat and spawning sanctuary for a wide variety of birds, mammals and marine life in addition to hosting a range of plant species and important biogeochemical processes. The capacity of salt marsh to intercept nitrogen is significant and well researched worldwide. Substantial areas of former salt marsh on the Cape are either under consideration for restoration or could be restored providing storm surge and coastal flooding protection in addition to water quality benefits in certain watersheds.

<u>Shellfish habitat restoration</u>: Oyster reefs were historically one of the main consumers and recyclers of nitrogen in the coastal environment on Cape Cod. According to the Nature Conservancy, populations have declined by 95%. In conjunction with the natural transition from land to sea in estuaries, bays and inlets; salt marsh, oyster reef and eel grass function as critical buffer that can reduce eutrophication. Restoring Oyster populations leads to increased shellfish productivity as well as improved commercial and recreational fisheries for other species, increased protection from shoreline erosion and flooding, and buffering from ocean acidification. (Case example, Wellfleet, MA).

<u>Aquaculture / shellfish farming</u>: Oysters have been proposed as a potential method for reducing nitrogen levels and eutrophication in estuaries. Nitrogen removal rates from Oysters have been well documented and the harvest of oysters physically removes the nitrogen they sequester in addition to the nitrogen removed by their biological cycling which puts nitrogen

directly back into the atmosphere. Aquaculture can be done on man-made structures (e.g. cages, floating bags) or natural reefs.

- *Shellfish habitat restoration and aquaculture/shellfish farming seem easily implemented.* Mr. Horsley commented that there are some permitting challenges to overcome, and that some people do not like these operations because they can impact their view in an embayment or along the coast.
- *Are there seasonality issues?* Mr. Horsley said that although the shellfish do filter feed year round, the animals feed less in winter. However, there is also less material and nitrogen in the water column in the winter.
- Ms. Hulet said she heard from another group that shellfish poaching could be an issue, too. Some working group members acknowledged this is a concern.
- Ms. Hulet posed the question of whether or not shellfish could be reestablished if the conditions in the embayment are the reason for their absence. A member replied that *shellfish bed closures were largely related to storm water issues and compliance with bacteria, so the beds could be reestablished provided these issues are addressed.*

<u>Surface water remediation wetlands</u>: Constructed to aid in water quality improvements to surface water bodies, usually streams or rivers. Water is pumped or allowed to flow naturally through treatment cells containing wetlands Surface water remediation wetlands are often used in combination with groundwater recharge or potable water reuse systems. Surface water remediation wetlands are generally used with Free-Water Surface wetlands due to their larger size, and lower capital and operation and maintenance costs. (Case example, China).

<u>Pond and estuary dredging</u>: Lakes, ponds, streams and estuaries store nutrients within their sediments. These sediments tend to accumulate over time. Subsequently, these nutrients can be release into the overlying water column and can become a major source of nitrogen and phosphorus. Dredging and removing these sediments and accumulated nutrients removes the nutrients from the water body and potentially the watershed. (Case example, Dennis, MA).

Cape-wide level technologies/approaches

<u>Compact development</u>: Both Compact Development and Open Space Residential Development (OSRD) of subdivisions result in smaller lots and less maintained lawn acres. The higher density development reduces wastewater collection costs while providing a common disposal area. Compact development is also referred to as "Smart Growth."

<u>Fertilizer management</u>: Managing fertilizer application rates to lawns, golf courses, athletic facilities and cranberry bogs. Residential lawn loading rates could be reduced on existing developed parcels through an intensive public education/outreach program. This could include a "Cape Cod Lawn" branding program, replacing some turf areas with native vegetation, establishing naturally-vegetated buffer strips on waterfront lots, and reducing application rates. Fertilizer loading rates for new development could be accomplished by reducing lot sizes (cluster development), by restricting lawn sizes and/or by incorporating more naturally-

vegetated open space areas. Municipalities could directly reduce fertilizer applications on athletic fields and other properties. Golf courses can significantly reduce nitrogen loading rates by using slow-release fertilizers and reducing application rates in rough areas. Cranberry bog fertilizer exports from the bogs can be reduced using tail water recovery systems. Site-specific assessments are needed to estimate load reductions. Recently the Cape Cod Commission designated a cape-wide Fertilizer Management District of Critical Planning Concern (DCPC) which authorizes the towns to adopt local fertilizer management regulations (state law prohibits local fertilizer management except under the DCPC). The DCPC does not require towns to adopt fertilizer regulations, but paves the way for their adoption. Barnstable County will be conducting a public education process around fertilizer use.

<u>Remediation of existing development</u>: Existing developments or schools with excess wastewater treatment capacity allow existing nearby developments to connect to their underutilized wastewater treatment infrastructure. A town can operate the wastewater treatment facility if the existing owner prefers to not take the responsibility for treating the off-site wastewater. An example of this is the Kingman Marina in Bourne, which was permitted to expand its development footprint in exchange for hooking up adjacent, existing homes to its wastewater treatment facility.

<u>Transfer of development rights</u>: A regulatory strategy that transfers development and development rights from one property (sending area) to another (receiving area) to direct growth and associated nutrient loading away from sensitive receiving watersheds or water bodies. The protected parcels (sending areas) receive a deed restriction that limits the level of future development. The deed restriction can limit the number of homes or tie development to the availability to future wastewater treatment facility infrastructure.

- *If some towns are better prepared to accept higher density population areas, what about the possibility of creating a preservation area or receiving zone in a different town than where the development occurs?* Mr. Horsley said that could be possible and noted that research shows it works well in areas with strong county governments.
- *Some communities would probably accept development for increased tax revenue. Another potential option is to transfer residential density to commercial.*

<u>Stormwater best management practices (BMP)</u>: Non-Structural Stormwater strategies include: street sweeping, maintenance of stormwater utilities, education and public outreach programs, land use planning, and impervious cover reduction and control.

Group members made these general questions and comments:

- *Thinking about all of the systems from a water conservation perspective, how does overall water volume use impact the different systems?* Mr. Horsley said some of the systems could reduce available water quantity. He noted that innovative solutions can reduce the impacts.
- *Should we have water conservation as a technology? It might help to put into perspective how much water we use today and how much water we might use with new approaches.*

- *We noticed in Orleans, Brewster, and Eastham that the plan assumed continual growth. But based on our calculations, population numbers are declining. We assumed people would eventually move into their seasonal home for the long term, but we are finding that people are buying second homes elsewhere and living there year round.*

IV. PROBLEM SOLVING PROCESS AND PRINCIPLES

Mr. Horsley noted that in many instances, one of the solutions may not achieve water quality goals, but pairings of multiple solutions may help to achieve the goals. For example, many towns are already using and pairing some of the technology options and approaches:

- Wellfleet- *Coastal habitat restoration & aquaculture*
- Mashpee- *Aquaculture & Expanding Existing Systems*
- Brewster- *PRB & Bioswales*
- Orleans- *Fertilizer Control By-Law*
- Harwich- *Muddy Creek & Cold Brook Natural Attenuation*
- Falmouth- *Aquaculture, Inlet Widening, Eco-Toilet Demonstration Project, PRBs, Stormwater Management (Little Pond Watershed), Fertilizer Control By-Law, Subsurface Nitrogen Removal Septic System*

Overview of 7-steps for Problem-Solving Process

Mr. Horsley said the the goal the Working Groups is to develop remediation options that would achieve water quality goals with a focus on first targeting low cost, low barrier options to reduce nitrogen and then considering more costly and traditional options later (e.g. sewering). Ms. Hulet reminded the group that phosphorous and freshwater quality maybe as much a concern as, if not more than, nitrogen in this watershed. Mr. Horsley then described the alternatives screening process the group will apply:

1) Establish targets and articulate project goals.
2) Identify priority geographic areas (e.g. high nitrogen reduction areas, Title V problem areas, pond recharge areas).
3) Determine which management activities should definitely be implemented. These might be the easiest and least costly management activities that should be undertaken regardless of other management actions (e.g. fertilizer management and stormwater mitigation – two approaches that Cape Cod towns are already actively pursuing).
4) Assess alternative options to implement at the watershed or embayment scale (e.g. innovative and lower-cost solutions)
5) Assess options to implement at the site-level
6) Examine priority collection/high density areas
7) Consider traditional sewering or other grey infrastructure management options

Mr. Horsley said that the Cape Cod Commission will present two scenarios at the next meeting. One scenario will use mostly grey infrastructure and the other scenario will use mostly green infrastructure to achieve water quality goals. The group will then discuss the scenarios and develop additional scenarios utilizing a mixture of grey and green infrastructure.

Mr. Horsley presented a map illustrating the percent of nitrogen removal required to meet TMDLs across the Cape and noted that this watershed does not have a TMDL target. He then presented a map indicating the percentage reductions required to meet TMDLs if only nitrogen from wastewater is removed. Noting that watershed groups will focus on the management total controllable nitrogen loads, Mr. Horsley then presented a bar graph showing the amount of nitrogen reduction required from the existing controllable nitrogen load to achieve a target nitrogen load. He said the selected technologies and approaches should aim to reduce the total controllable nitrogen load. Implementing storm water and fertilizer regulations reduces the amount of required nitrogen reduction from the existing controllable nitrogen load, thus minimizing the portion of septic load that needs to be reduced. Additionally, the percentages of controllable nitrogen that need to be removed to meet TMDLs change depending on the characteristics of the watershed, but this watershed does not have a TMDL.

Mr. Horsley next presented a map of percolation rates on the Cape. He noted that if sewers were installed today in the areas where percolation rates are 100 years, then it would take approximately 100 years to see the benefits of the sewer installation. But, aquaculture in the bay would show changes in months or years. He posed the question of whether or not pilot projects should be installed and monitored as part of a hypothetical plan A, then have a hypothetical plan B to adaptively manage nutrient reduction into the future.

A group member commented on the importance of choosing nutrient reduction activities in a phased approach. She noted that according to the percolation rate map, Brewster is looking at a minimum of 40 years for nutrient laden water to reach Pleasant Bay from inland locations. Therefore, if nutrient reduction activities are implemented where percolation rates are faster, quicker reductions will occur. Another member said they should start at the estuary's edge and work inland.

The group briefly discussed phosphorous management in freshwater systems. One member said the fertilizer regulations limit the amount of phosphorous unless soil tests show reduced phosphorous concentrations in the soil. Another member said the MEP reports note the connection between ponds and the water table. The member commented that changes in water quality should be seen quicker in the ponds than they will be seen on the coasts because of the percolation rates.

Categories of Solutions and their Impacts on the Environment, Economy, and Community

Ms. Hulet commented that evaluation of the technologies and approaches would be informed by their impacts (positive and negative) on the environment, economy, and community (Triple Bottom Line). She asked the participants what criteria they would use to decide whether or not they like a particular scenario. Working group members offered the following suggestions. They are grouped by theme where appropriate, but many categories are linked.

<u>Financing</u>

- *Who pays for it / how is it financed?*
- *What would you do if you owned the estuary and were spending your own money to clean it up?*
- *Amount of investment required to demonstrate that a pilot project works.*

Performance
- *Speed of impact relative to the technology*
- *How much impact can we have while using least cost technologies?*
- *Likelihood of success in a given time period, especially for pilot projects.*
- *Potential for phased implementation while also utilizing pilot projects—what actions will be taken to address the issue while we wait to collect data to verify effectiveness of pilot projects?*
- *Sustainability of the scenario – diverse infrastructure mix may be required to maintain system resiliency.*
- *How do we measure the sustainability of the infrastructure scenarios?*
- *How great is the margin of error?*

Regulatory and Political Feasibility
- *Which approaches or scenarios are most politically feasible?*
- *Which approaches or scenarios could be permitted quickly?*

Other
- *Barriers to implementation*
- *Consistency with local comprehensive wastewater management plans, especially in regards to planned and anticipated buildout.*
- *Citizens in some towns are not paying attention to this issue. In Yarmouth, a concern is that that no one will interest in this issue. It might be useful to provide towns with opportunities to take on leadership roles for specific technologies, i.e. "hallmark" pilot projects for each town.*
- *Common elements that could be done by all towns*

To conclude this segment of the meeting, Mr. Horsley asked participants to describe what they believe should be the water quality goal or goals in this watershed, given the fact that we do not have MEP data. Participants did not have a clear set of recommendations. At one point Sandwich suggested suing the targets they have previously estimated, but then later (in an email after the meeting), they asked for the Commission to wait until MEP data is available.

Technology Selection: Process and Principles
Mr. Horsley noted that the Working Group had identified some of the principles that the Cape Cod Commission hoped would guide technology/approaches selection. These process and principles include:
- *100% septic removal subwatershed*: Combinations of technologies can be used to reduce septic load that needs to be removed.

- *Scale: On-Site vs. Collection System vs. Natural System*: There will be tradeoffs between the scale of systems that can be used. On-site, collection, and natural systems all have their pros and cons and all require different levels of investment and infrastructure. These tradeoffs will be important from an implementation and public acceptance point of view.
- *Nutrient intervention and time of travel*: Some technologies/approaches intercept nutrients at their point of entry into the system, while others deal with it later on (e.g. once it is in the watershed). There are pros/cons to each approach which need to be considered.
- *Permitting Status*: The level of effort required to permit technologies will be a consideration.
- *Land use and Impacts of Growth*: Unintended consequences and opportunities for planned growth are important to consider.

V. PLANNING FOR THE NEXT MEETING

Meeting Three will be held:
Monday, December 9, 2013
8:30AM -12:30PM
Cape Cod Commission, 3225 Main Street, Barnstable, MA 02630

During this meeting the Working Groups will examine various scenarios (i.e. combinations of solutions) and their potential impacts (e.g. nutrient reduction, economic impacts, environmental impacts, social impacts, etc.). During the meeting, the Cape Cod Commission will use tools to calculate ideas/options and their impacts. Working Group participants should come prepared to offer their ideas about what solutions they'd like to explore further given their understanding of the baseline conditions, issues, and priorities in this watershed.

VI. PUBLIC COMMENTS

There were no public comments.

APPENDIX ONE: MEETING PARTICIPANTS

Name	**Affiliation**
Working Group Members	
Elizabeth Jenkins	Principle Planner, Town of Barnstable
Ed Leonard	Consultant engineer with Town of Sandwich
Sue Leven	Town of Brewster, Planner
David Mason	Sandwich Public Health Department
Peter McDowell	Dennis Water District Wastewater Committee
Ed Nash	Golf Course Superintendents Association
Sue Phelan	Barnstable
Dan Santos	Barnstable DPW
Charles Spooner	Yarmouth Port
Staff and Consultants	
Scott Horsley	Area Manager for the Mid Cape Groups and Consultant to the Cape Cod Commission
Erin Perry	Cape Cod Commission
Maria McCauley	Cape Cod Commission
Carri Hulet	Consensus Building Institute
Eric Roberts	Consensus Building Institute