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

Mashpee Town Hall
16 Great Neck Road North, Mashpee, MA 02649
October 30, 2013, 1:00-5:00 p.m.

Agenda

1:00 Welcome, Review 208 goals and Process and the Goals of today's meeting – *Cape Cod Commission*

1:10 Introductions, Agenda Overview, Updates and Action Items– *Facilitator and Working Group*

1:30 Range of Possible Solutions – *Cape Cod Commission and Working Group*

- Technology Matrix
- Technologies Overview
- Survey Questions and Comments
- Additional Questions and Discussion

3:00 Break

3:15 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

4:30 Preparing for Meeting 3 and Beyond – *Cape Cod Commission*

- Review Tools, Alternatives Analysis Approach
- Evaluating Scenarios for Meeting Nitrogen Goals
- Other Process Next Steps

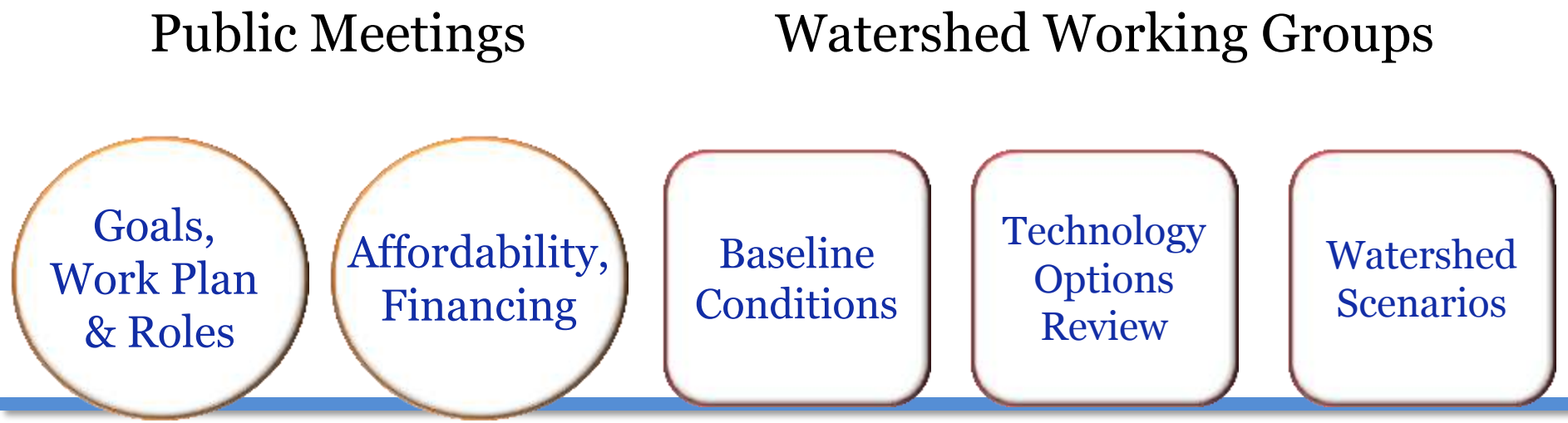
4:45 Public Comments

5:00 Adjourn

Popponesset Bay & Waquoit Bay Group

Technologies and Approaches

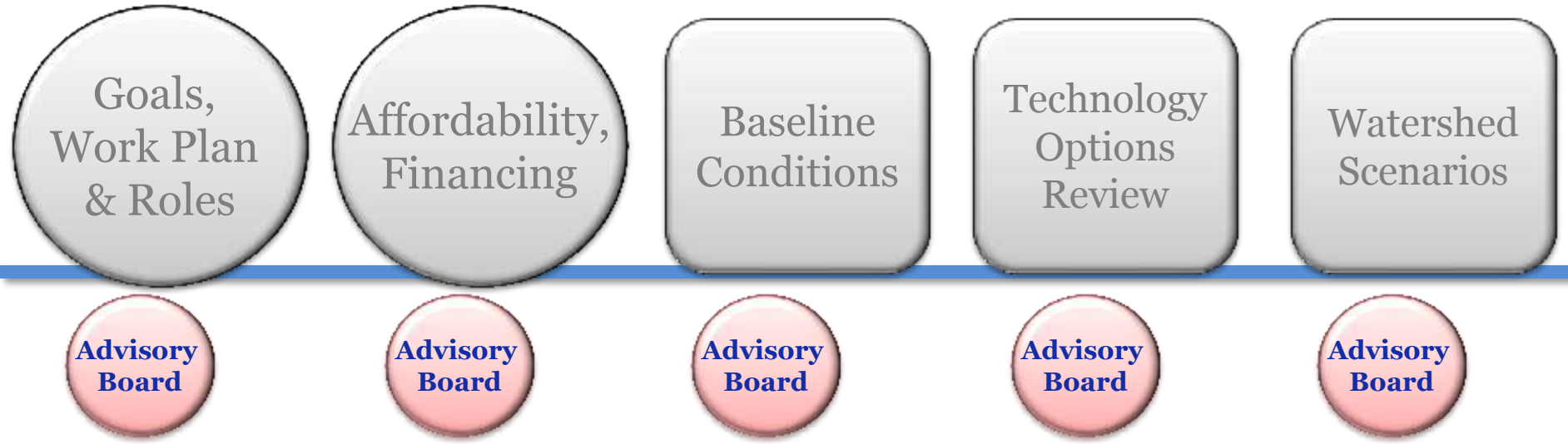
What is the stakeholder process?



208 Planning Process

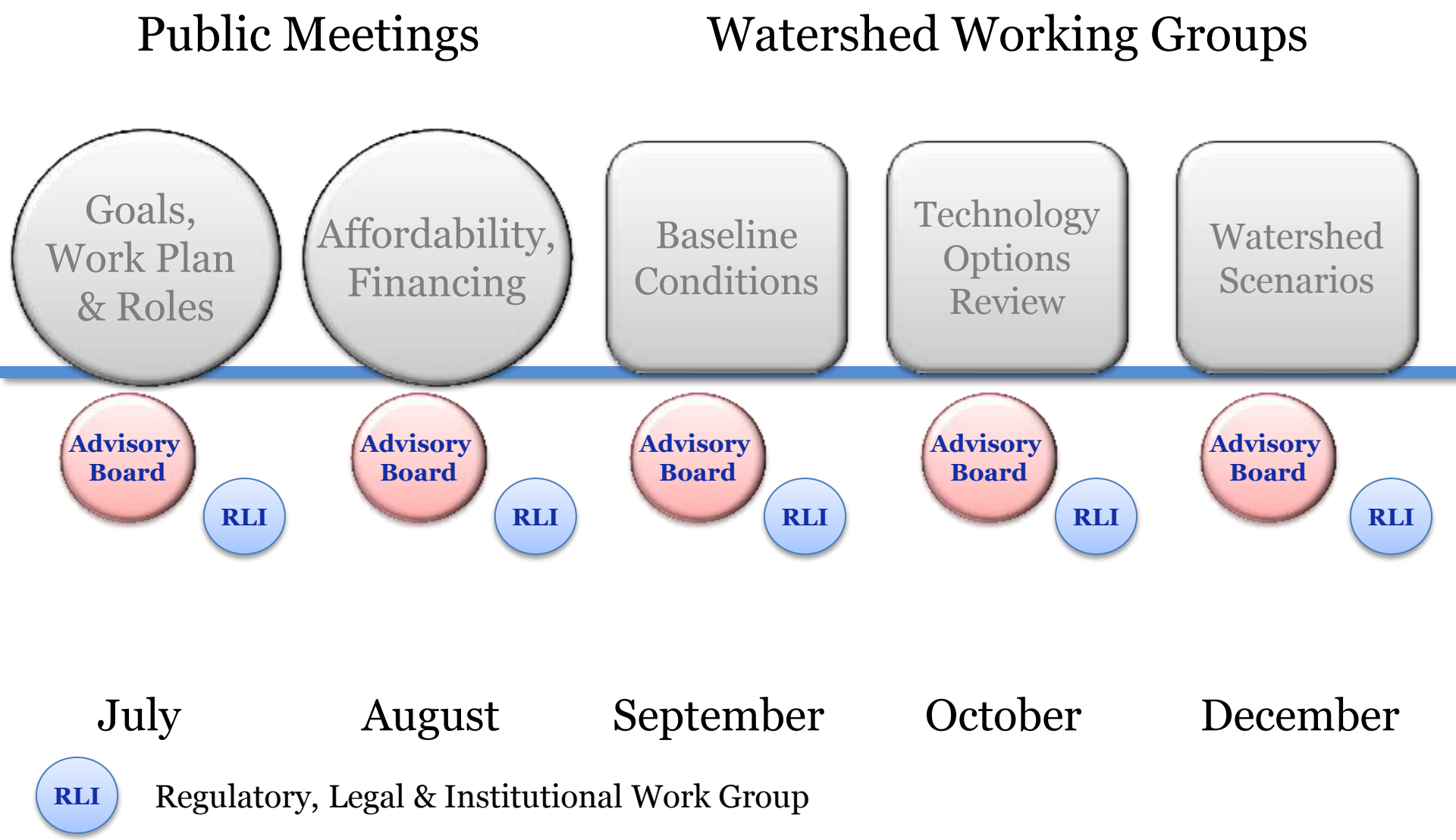
Public Meetings

Watershed Working Groups



July August September October December

208 Planning Process



208 Planning Process

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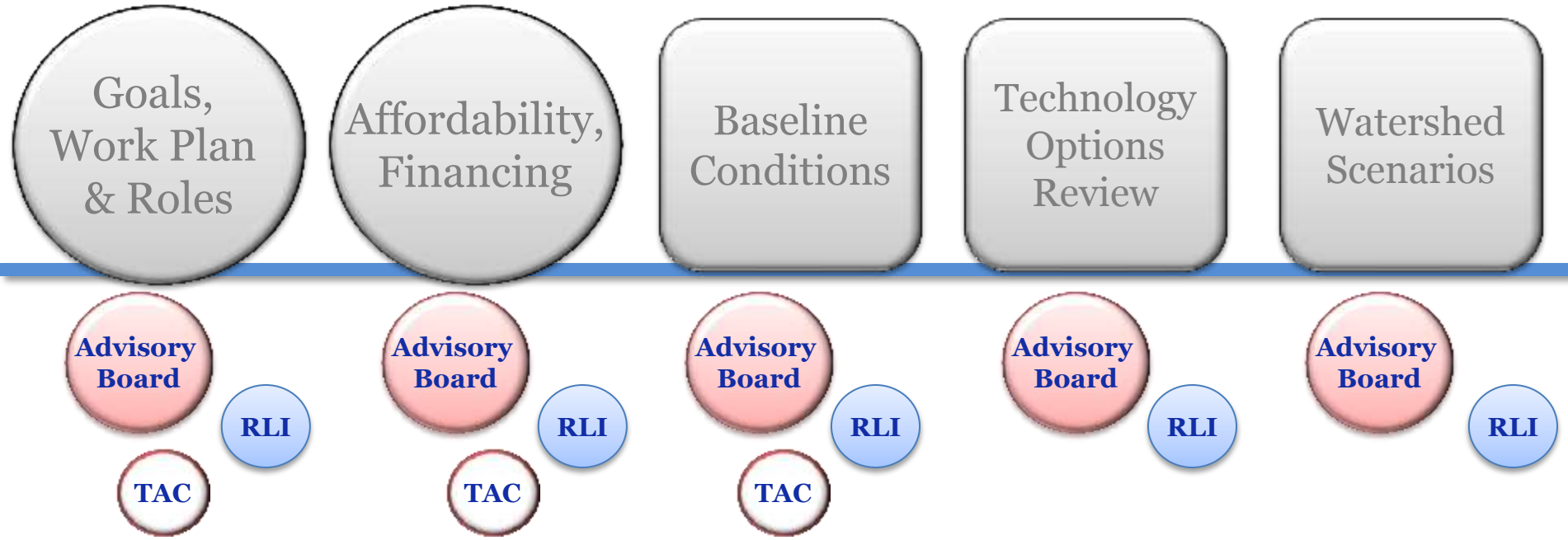


July August September October December

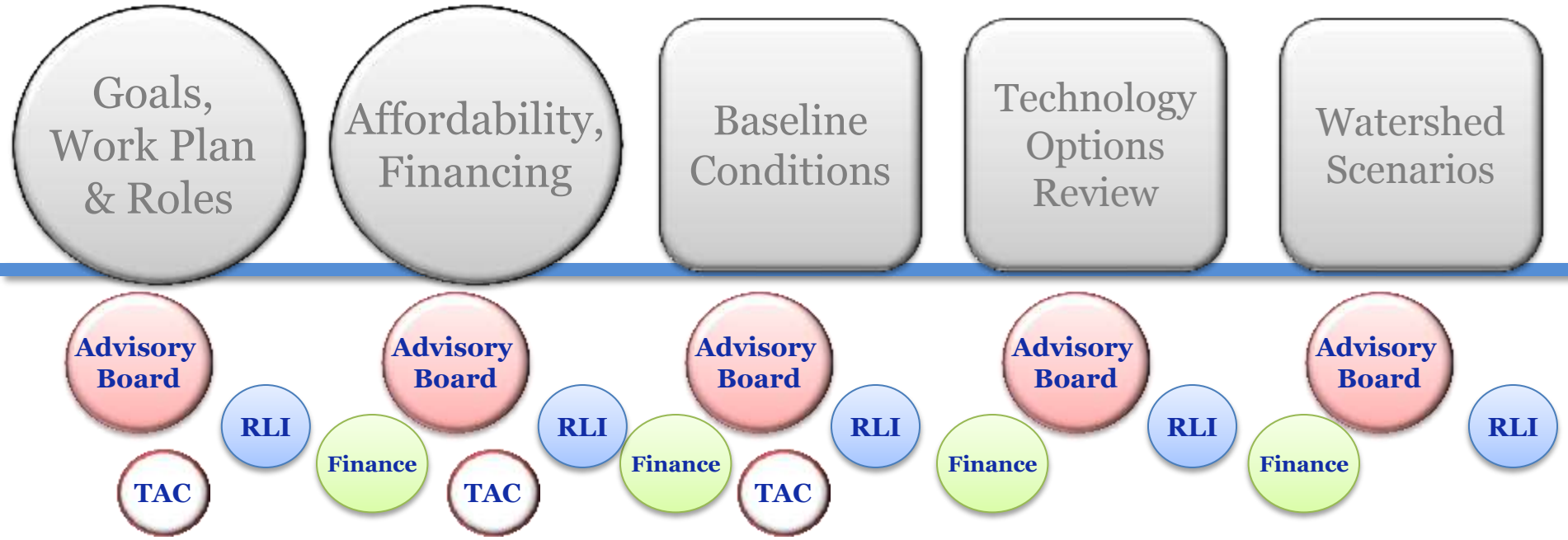
RLI Regulatory, Legal & Institutional Work Group

TAC Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process

Public Meetings

Watershed Working Groups



July August September October December

RLI — Regulatory, Legal & Institutional Work Group

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208 Planning Process

Public Meetings

Watershed Working Groups

Goals, Work Plan & Roles

Affordability, Financing

Baseline Conditions

Technology Options Review

Watershed Scenarios

July August September October December

RLI — Regulatory, Legal & Institutional Work Group

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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

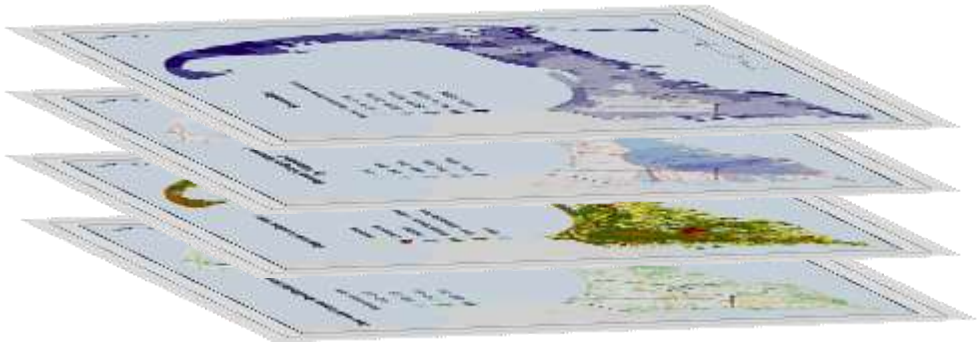
11 Working Group Meetings: Sept 18-27

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

208 Planning Process

Baseline Conditions	Technology Options Review	Watershed Scenarios
11 Working Group Meetings: Sept 18-27	11 Working Group Meetings: Oct 21-Nov 5	11 Working Group Meetings: Dec 2-11



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

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

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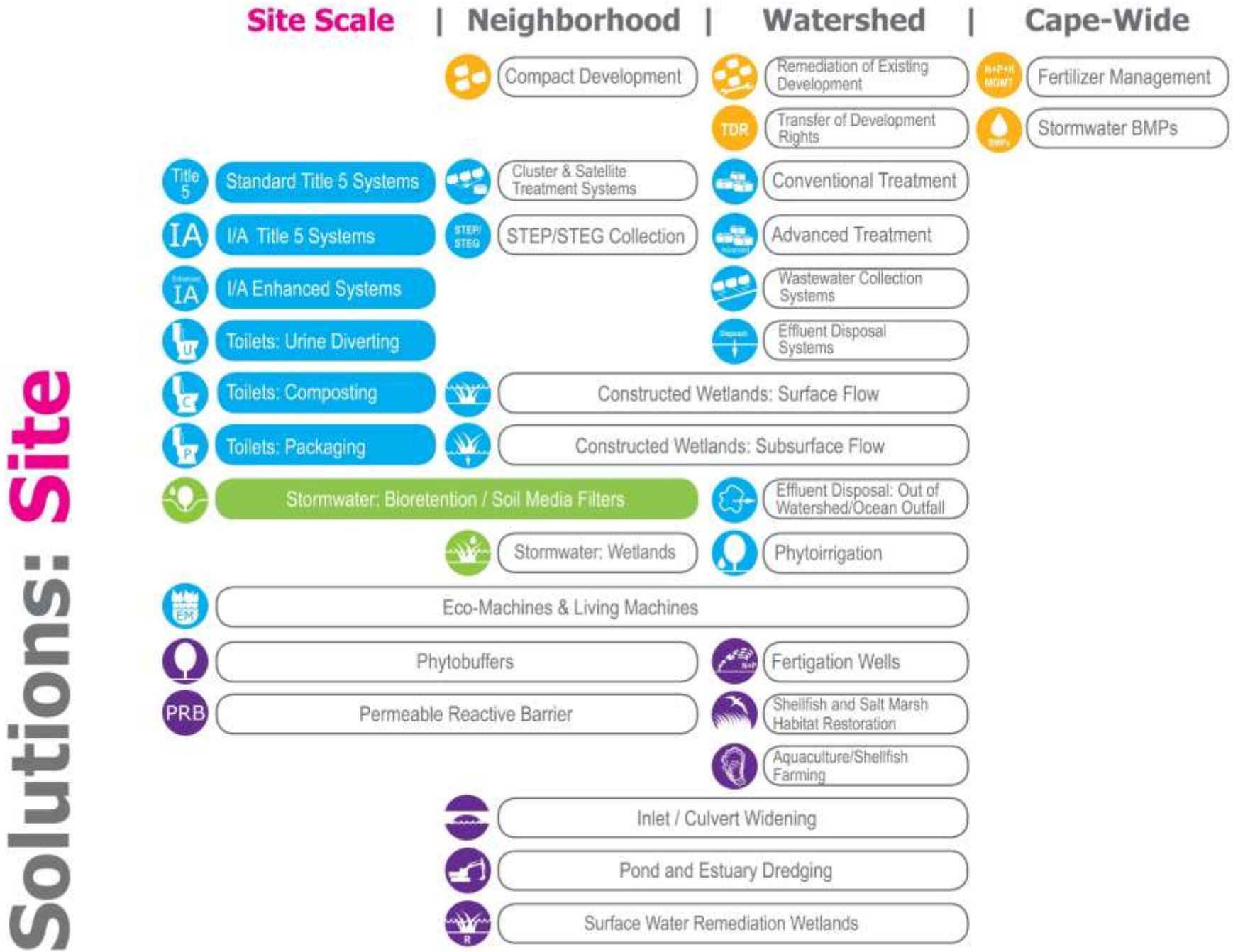
- Regulatory programs can address nutrient controls for both existing development and future development.


Site Scale | Neighborhood | Watershed | Cape-Wide
Solutions
Compact Development
Remediation of Existing Development
Fertilizer Management
TDR
Transfer of Development Rights
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
IA
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
EM
Eco-Machines & Living Machines
Phytobuffers
Fertigation Wells
PRB
Permeable Reactive Barrier
Shellfish and Salt Marsh Habitat Restoration
Aquaculture/Shellfish Farming
Inlet / Culvert Widening
Pond and Estuary Dredging
Surface Water Remediation Wetlands


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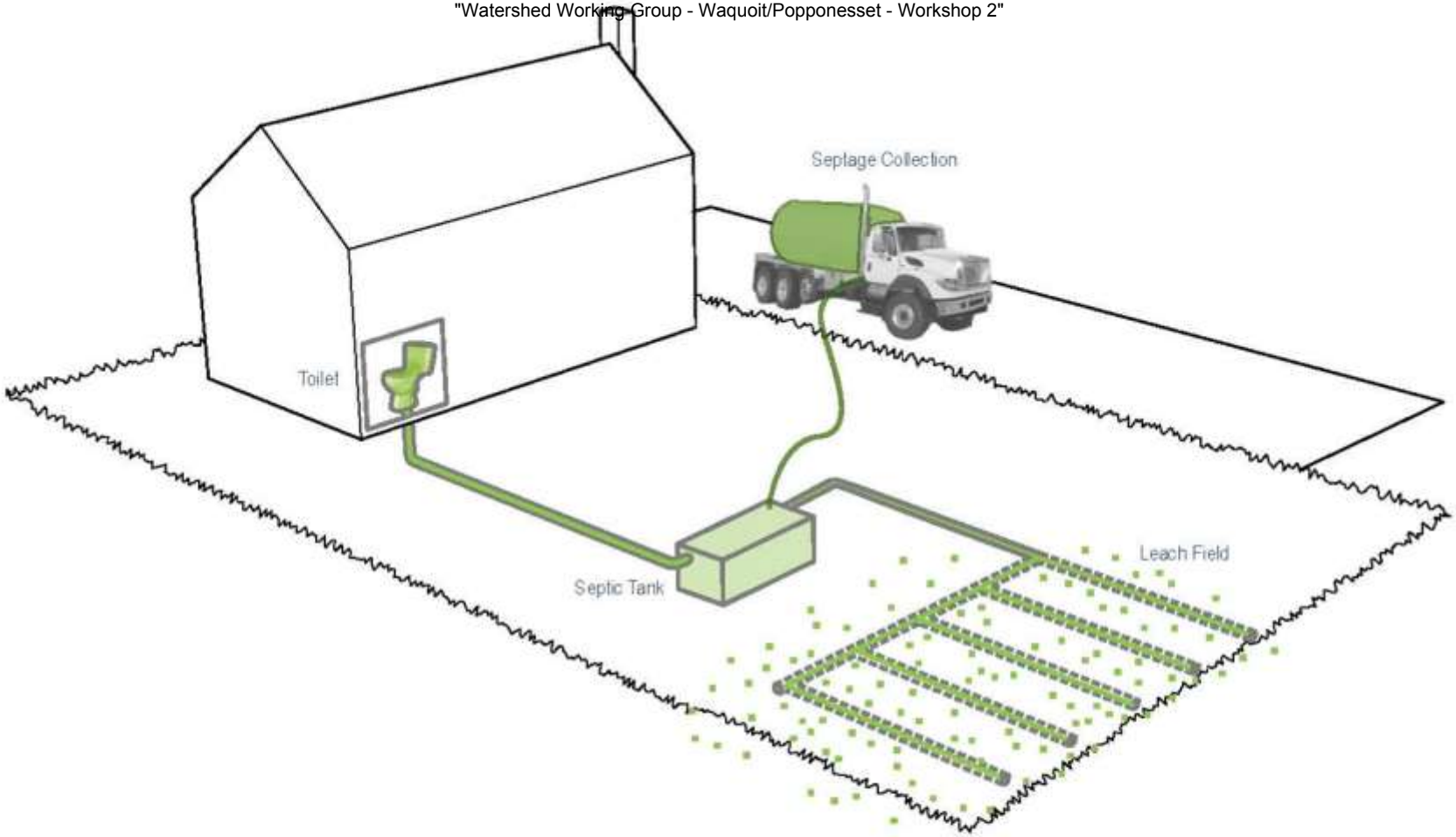
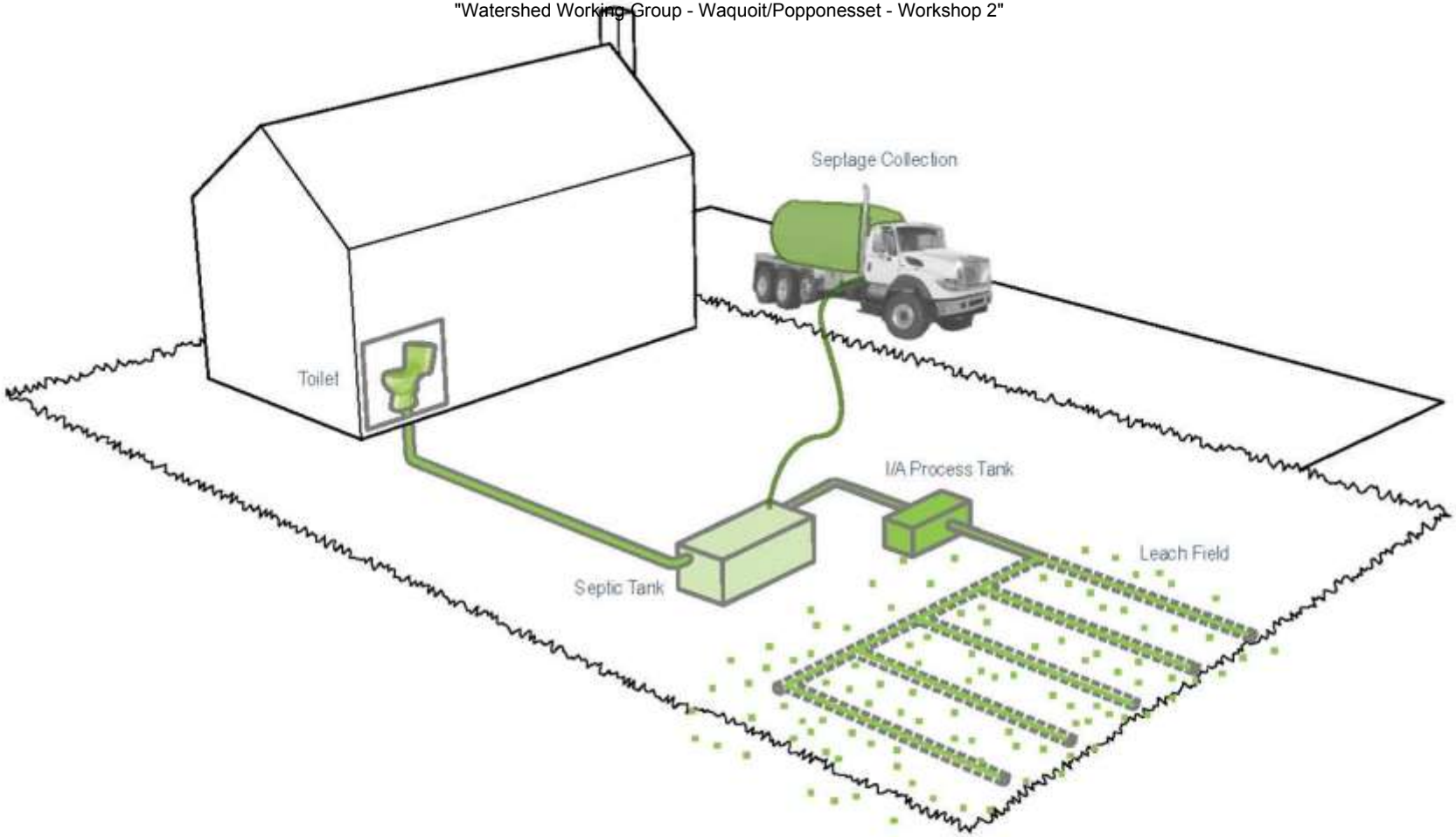


Scale: SITE
Target: WASTEWATER

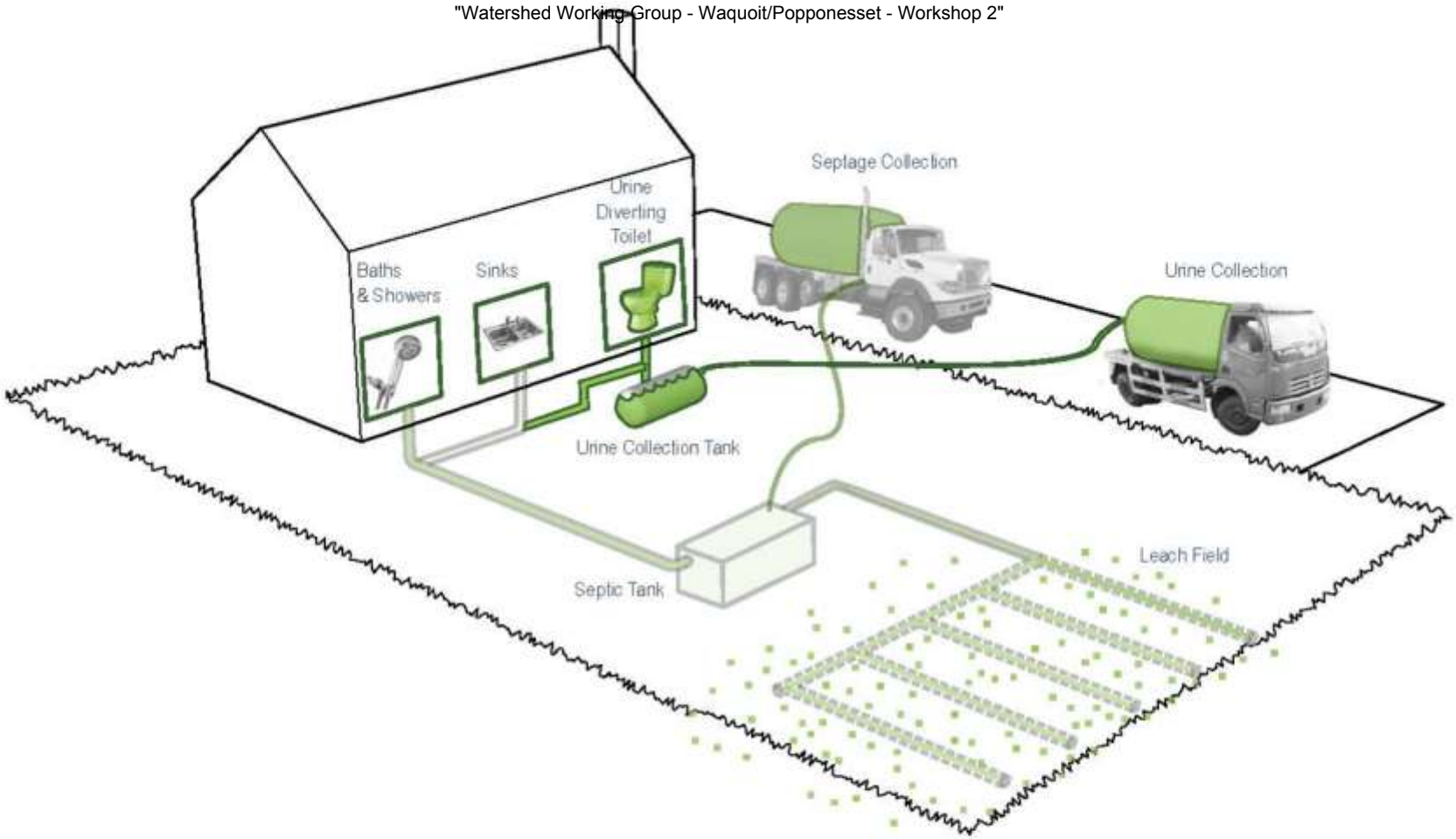
Standard Title 5 Systems

Title 5



Scale: SITE
Target: WASTEWATER

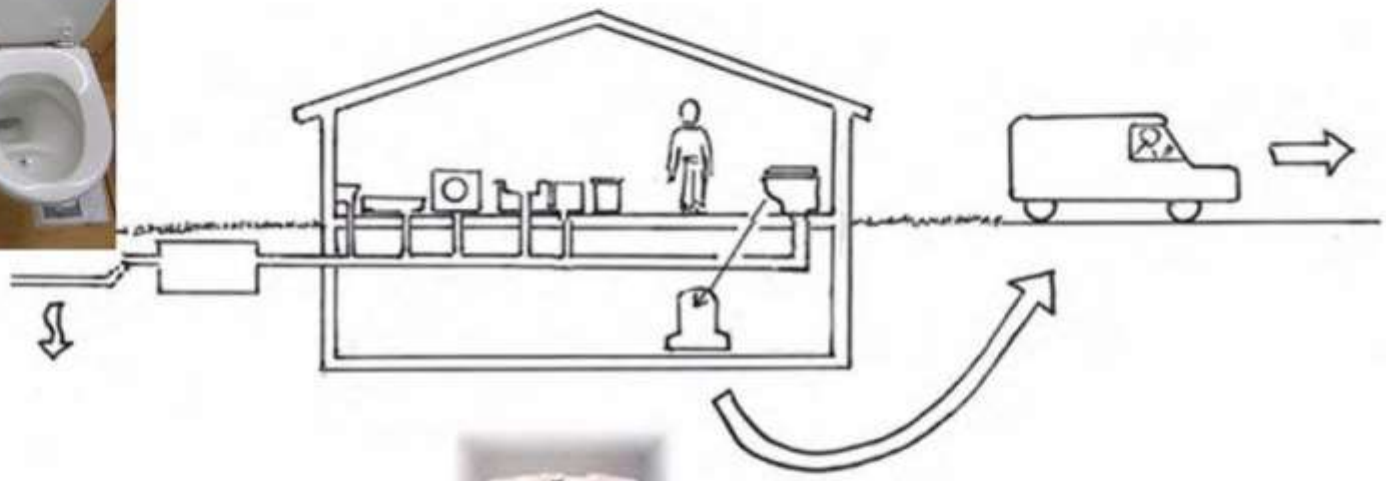
I/A Title 5 Systems



Scale: SITE
Target: WASTEWATER

Toilets: Urine Diverting

Waterless
Urinal

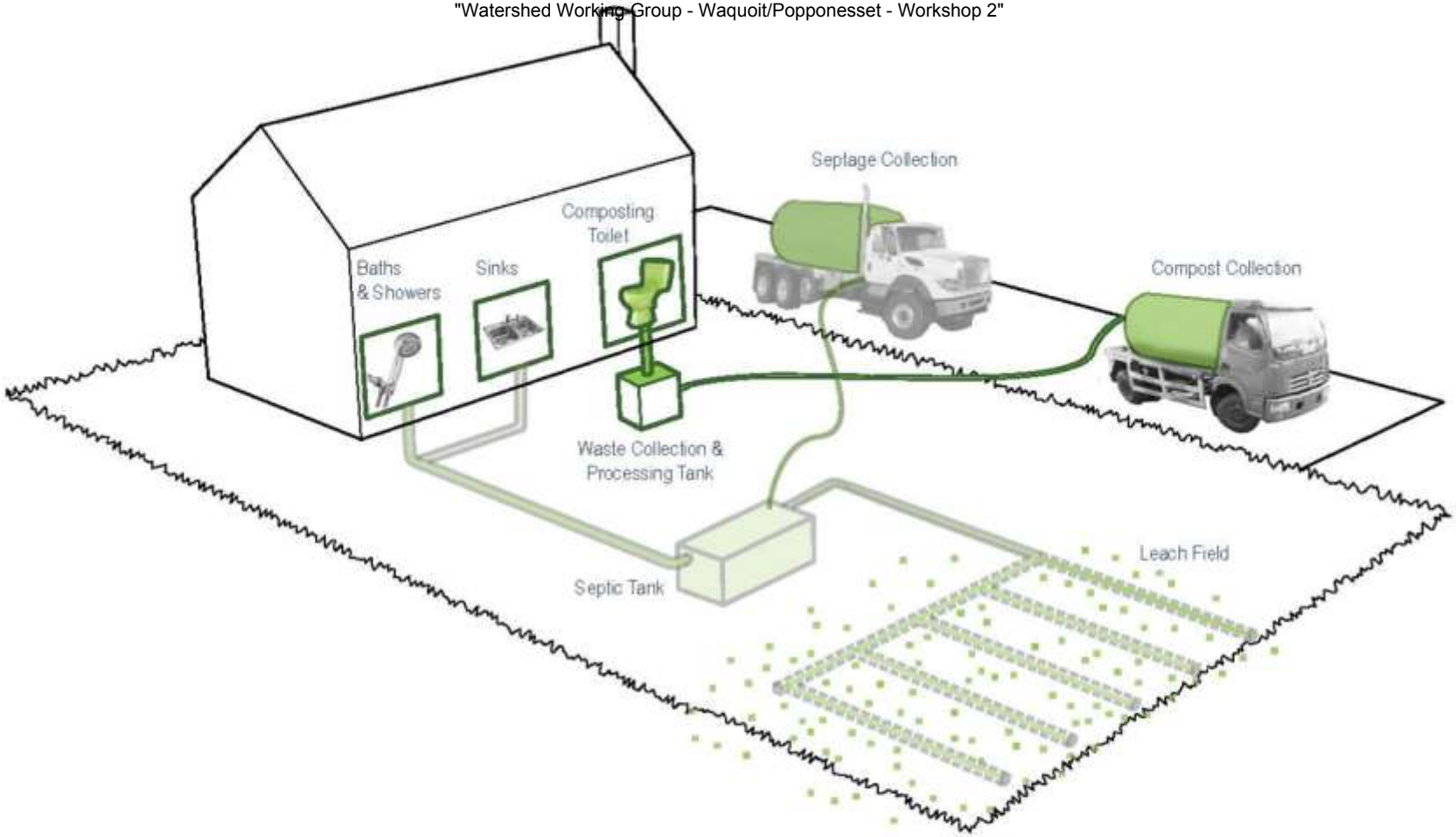


IBC container
(220 gallons)

40" x 40" x48"

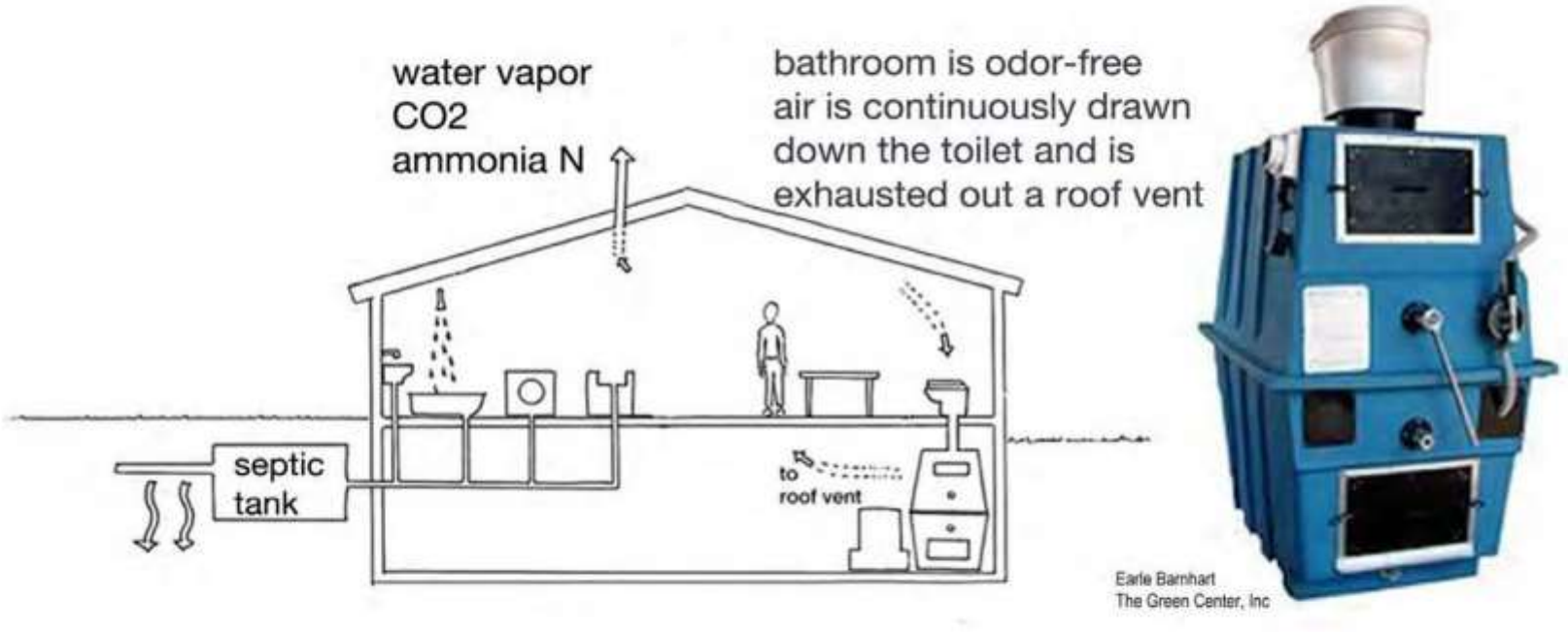
Source: Earle Barnhart, The Green Center Inc. and Horsley-Witten Group Inc.

Toilets: Urine Diverting



Scale: SITE
Target: WASTEWATER

Toilets: Composting



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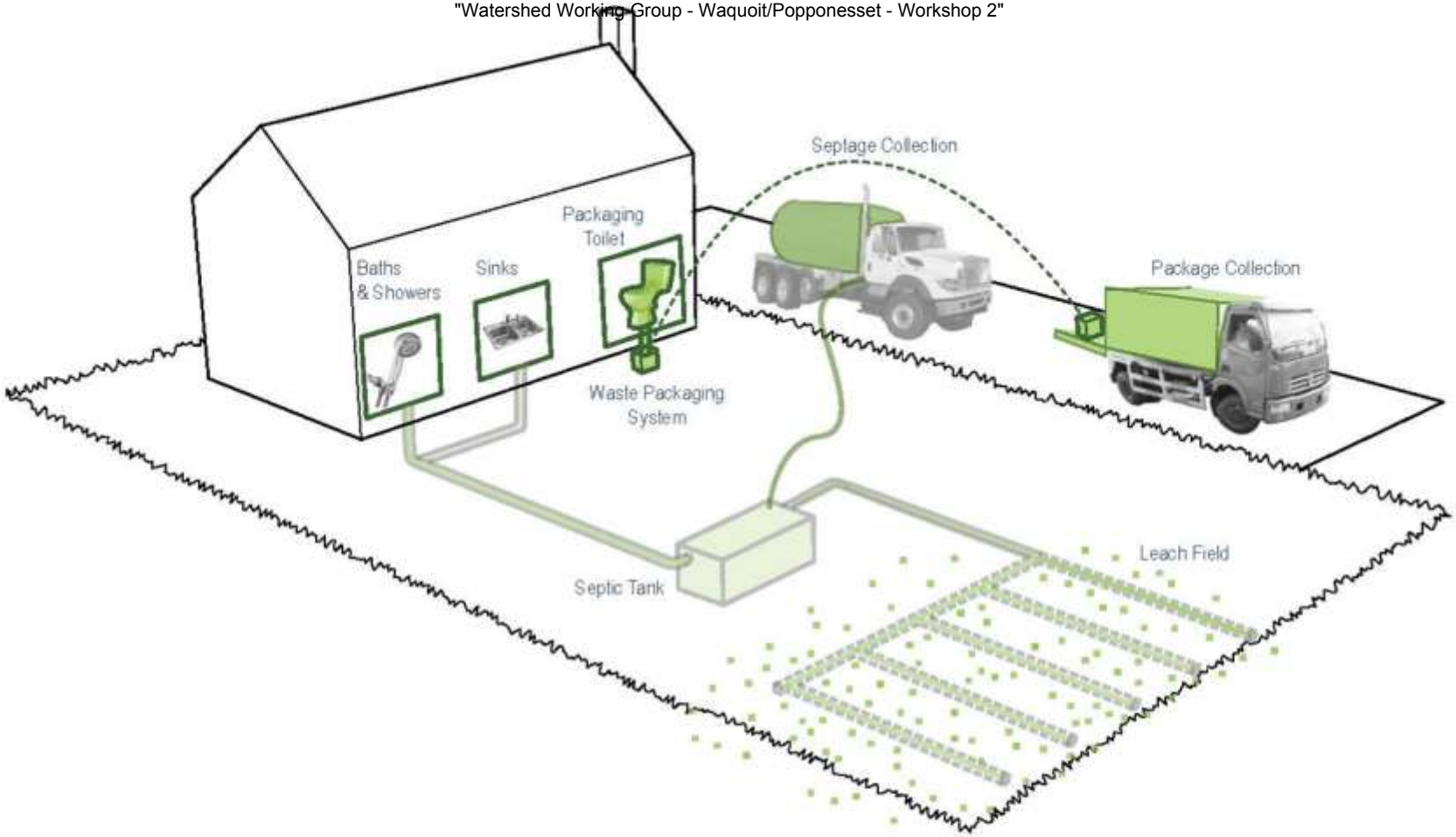
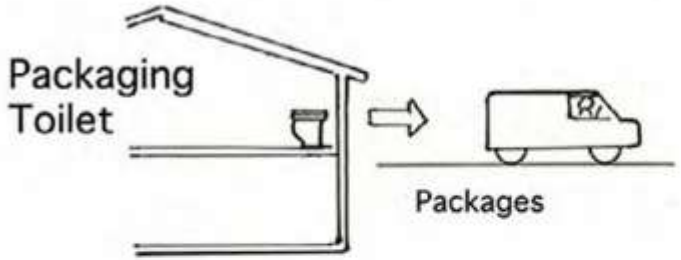


Scale: SITE
Target: WASTEWATER

Toilets: Packaging

PACTO®

LOOWATT



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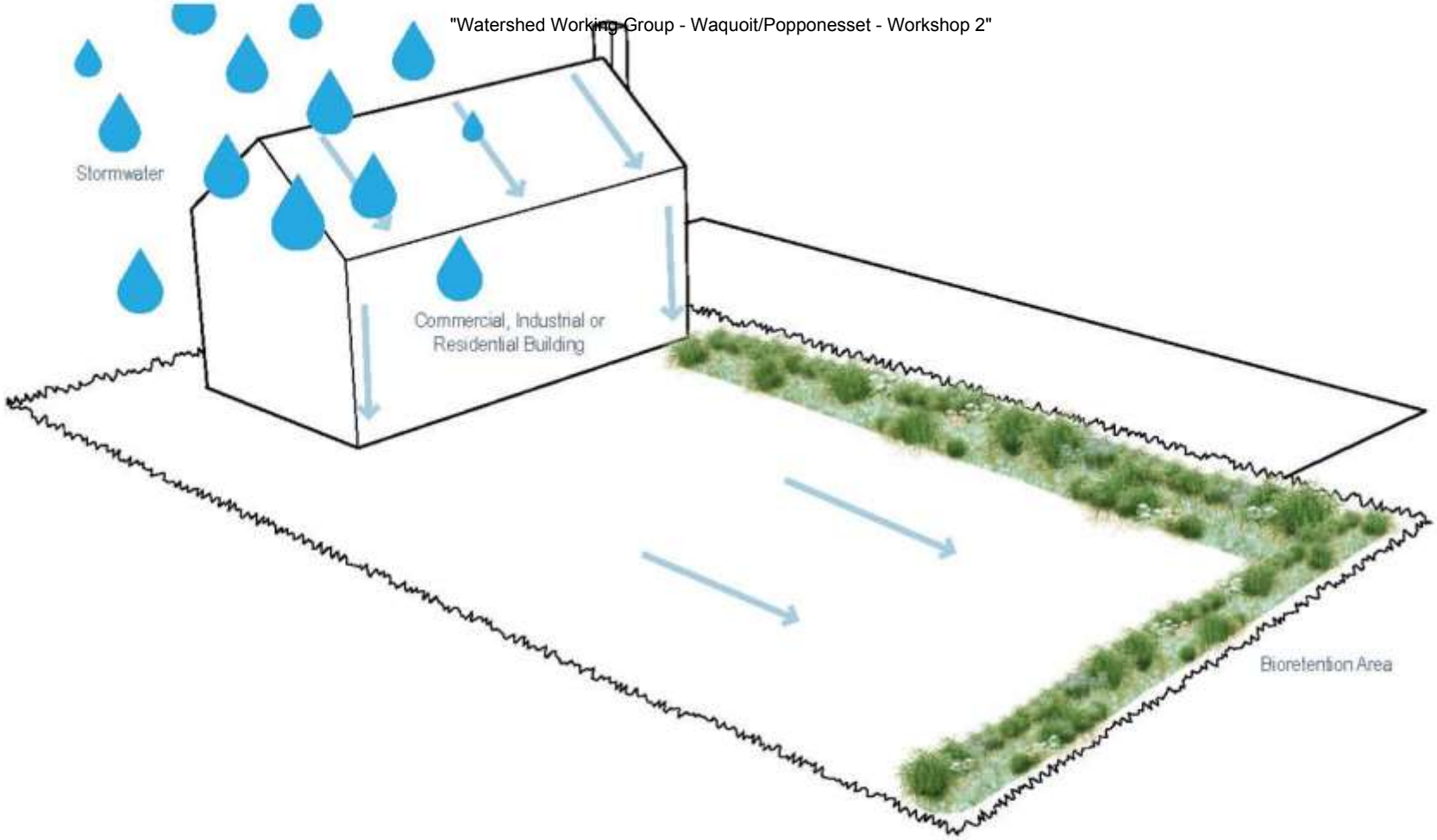
Toilets: Packaging



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
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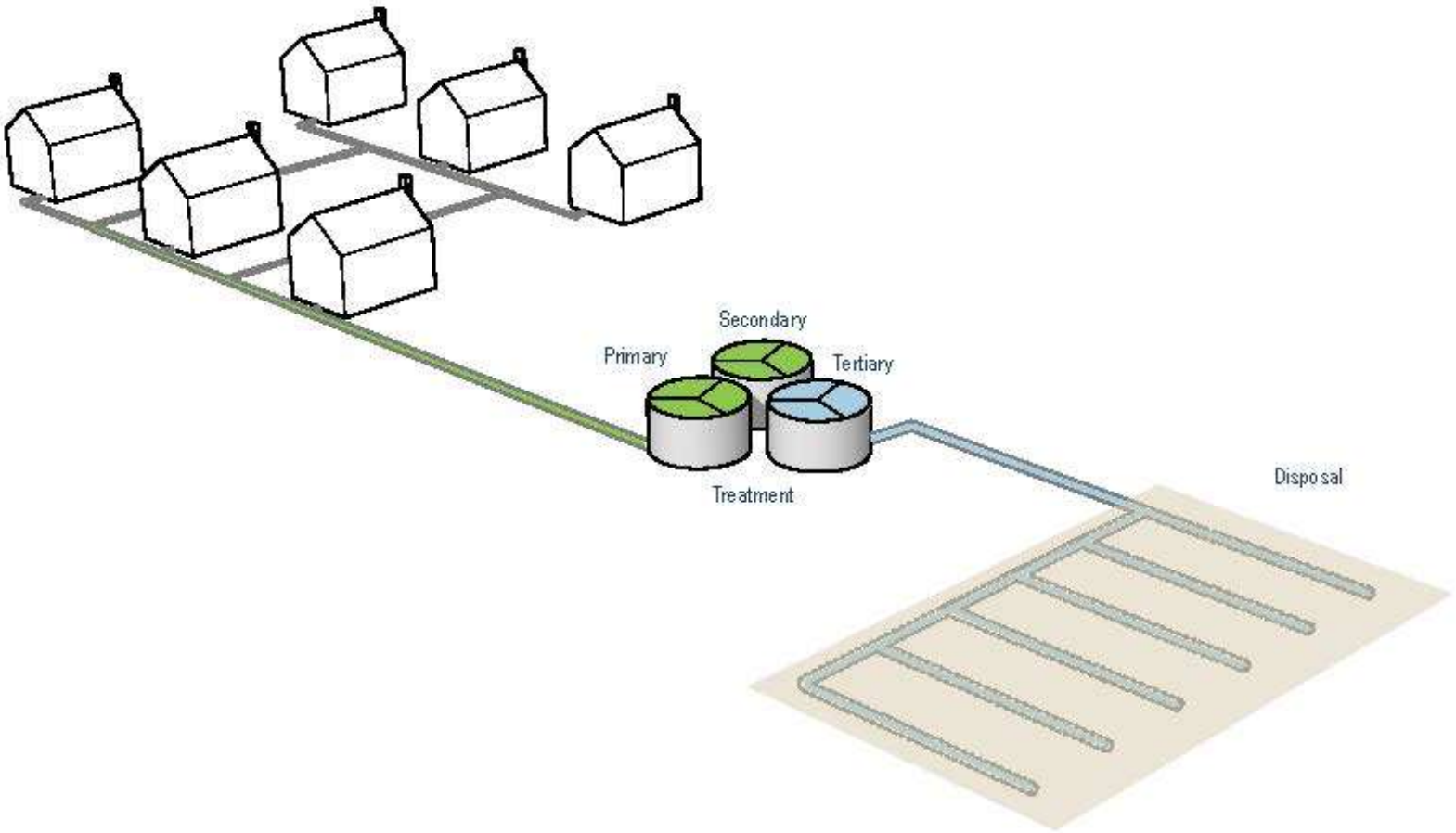
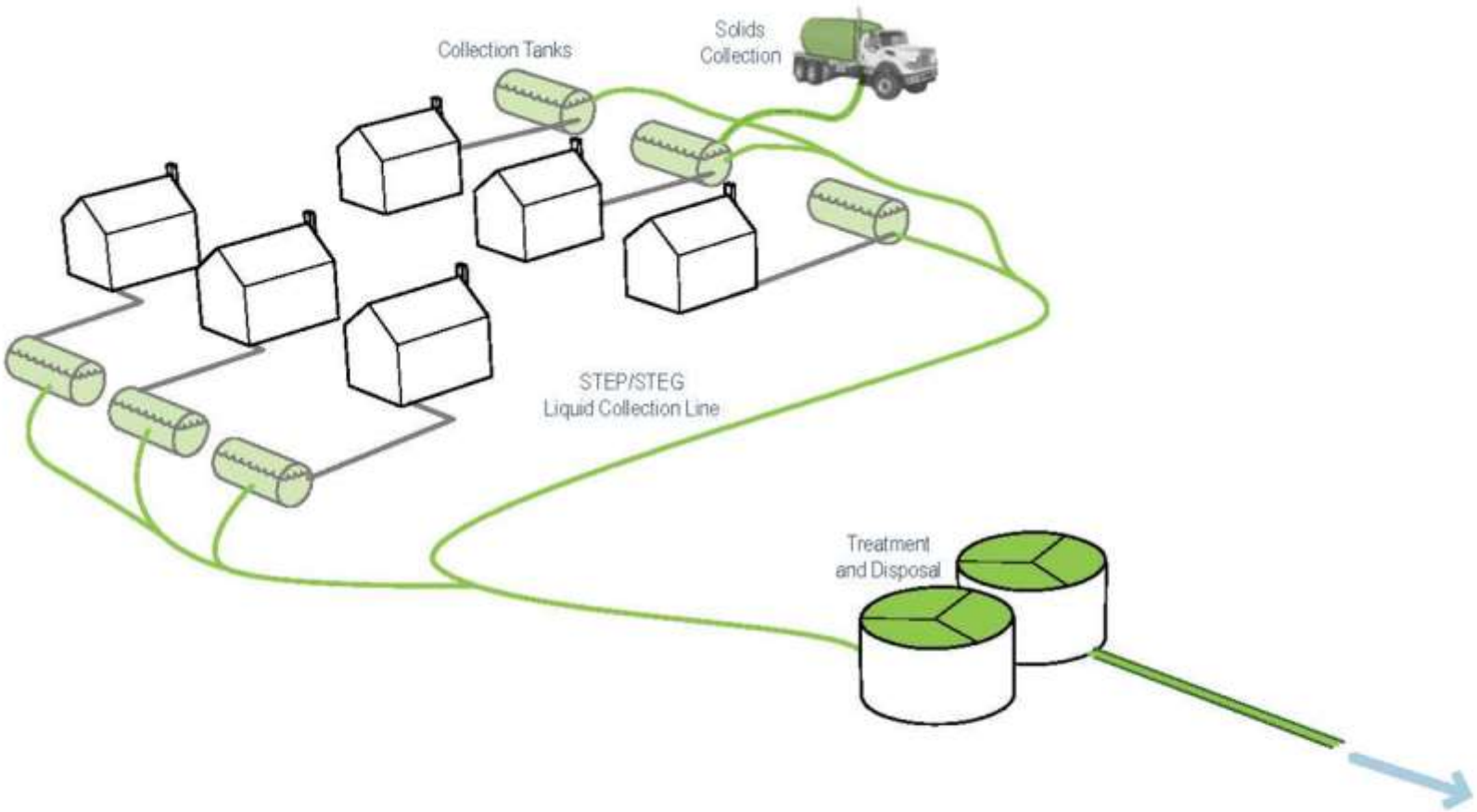


Scale: NEIGHBORHOOD
Target: WASTEWATER

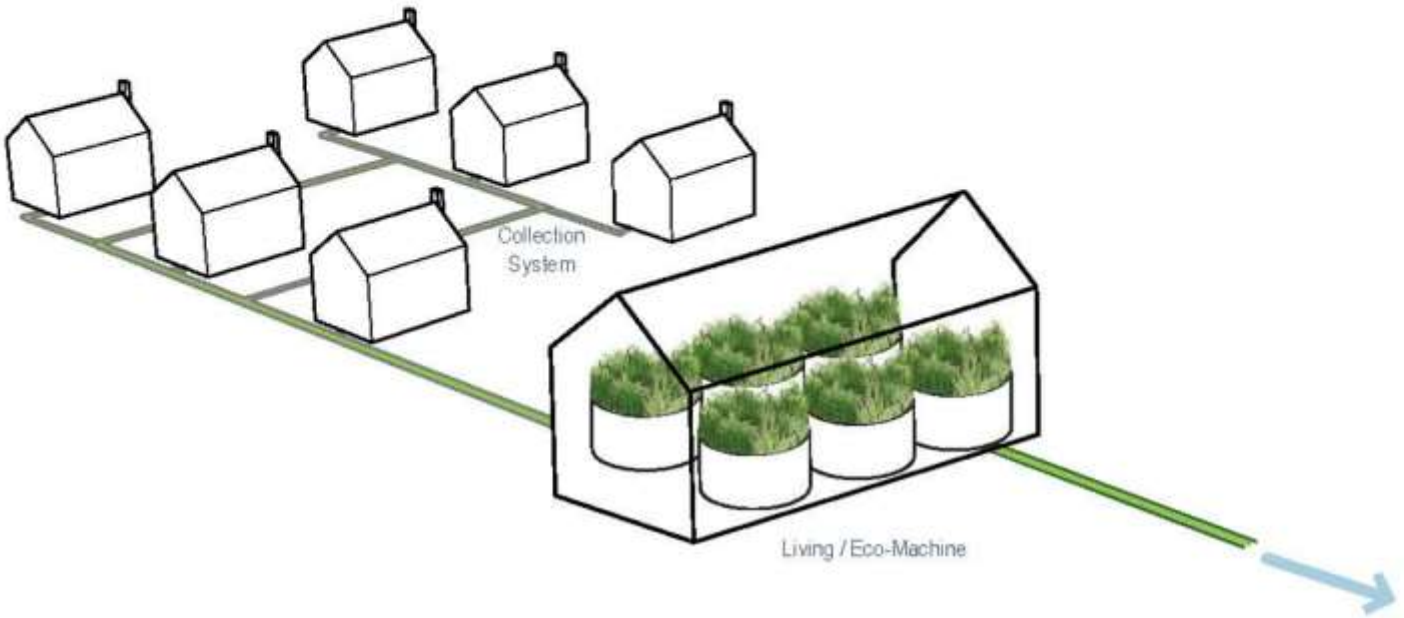
Cluster & Satellite Treatment Systems



Scale: NEIGHBORHOOD
Target: WASTEWATER

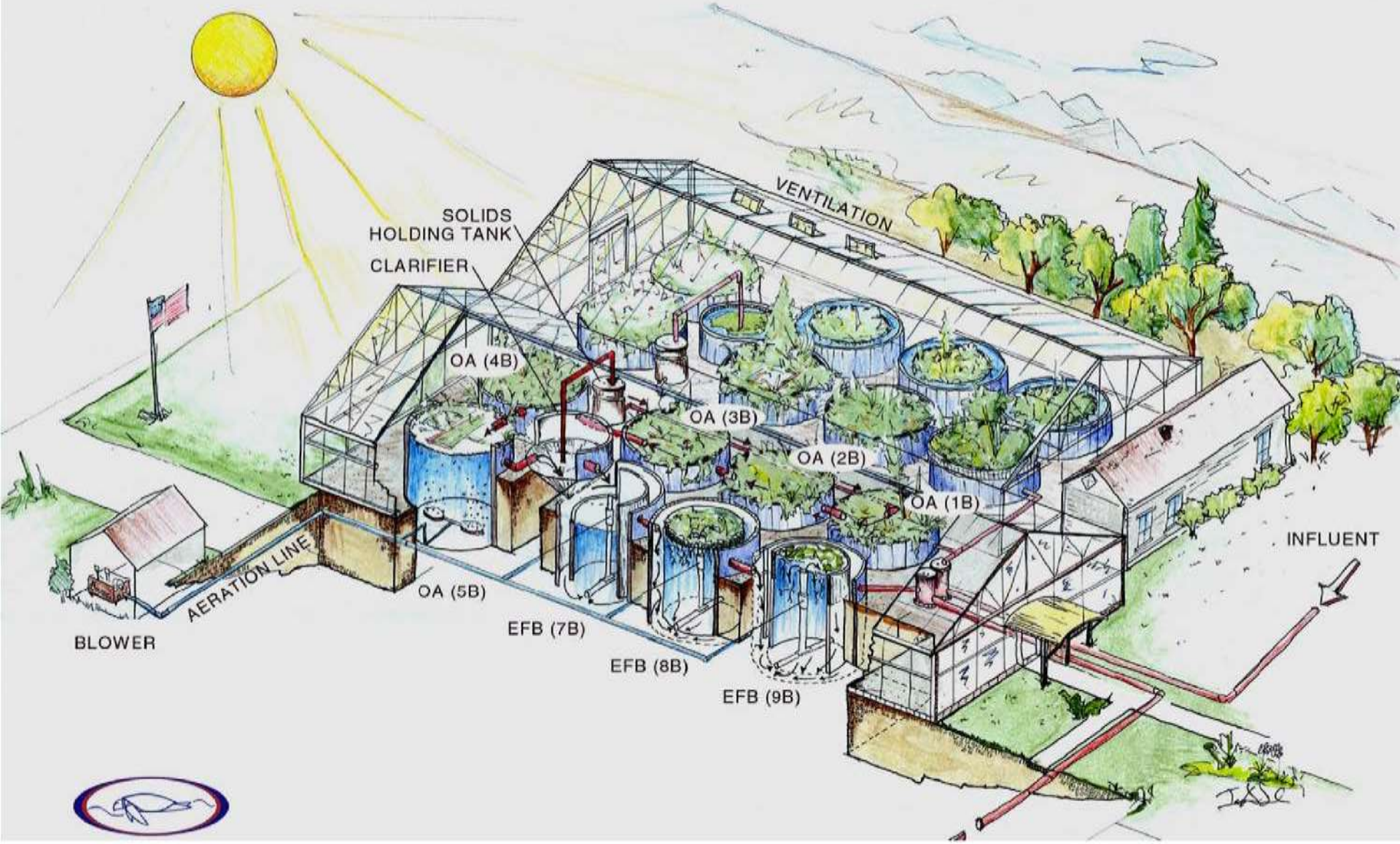
STEP / STEG Collection

STEP/
STEG



Scale: NEIGHBORHOOD
Target: WASTEWATER

Eco-Machines and
Living Machines

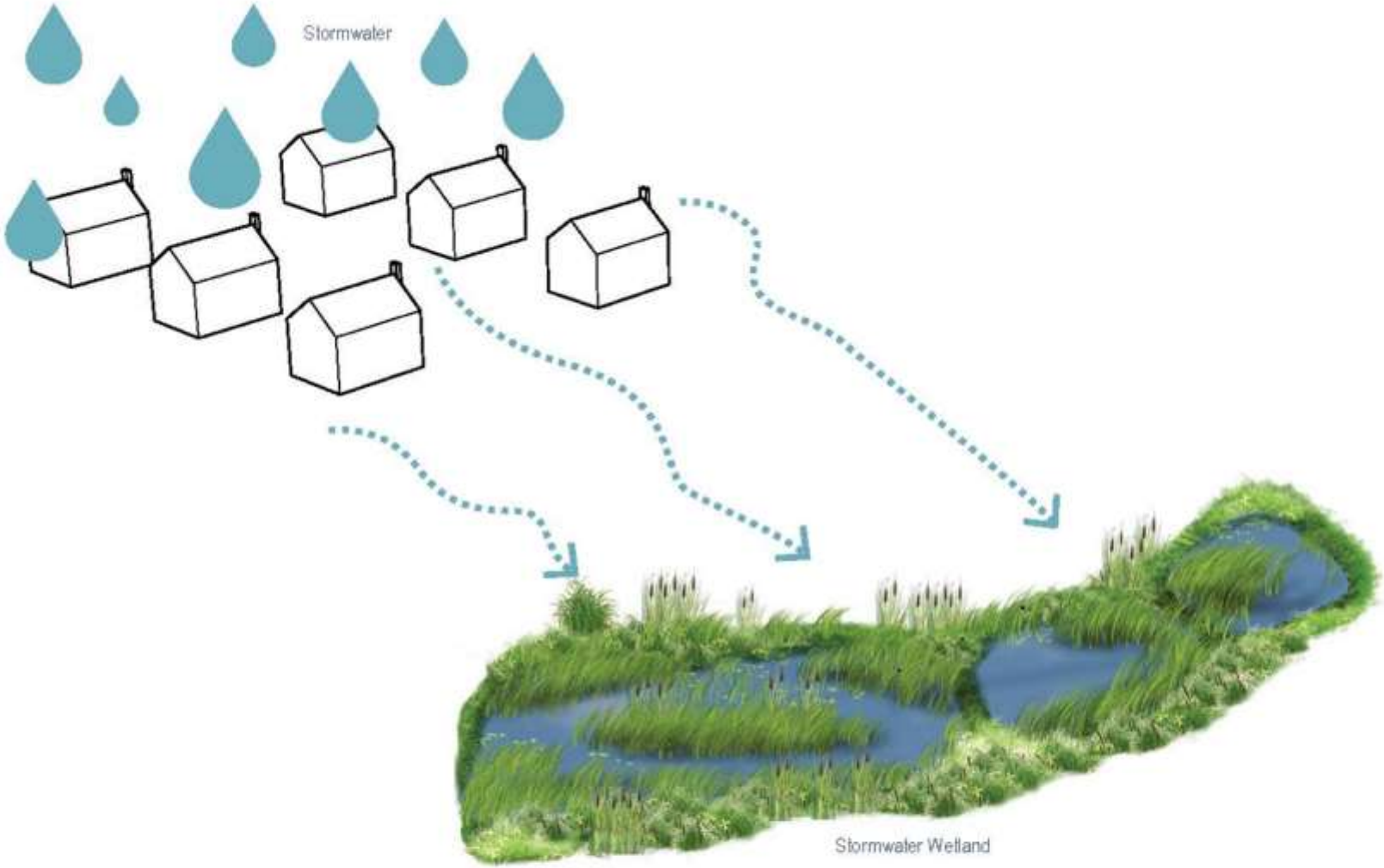


Precedent: Living Machine, South Burlington, VT
Source: Todd Ecological

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

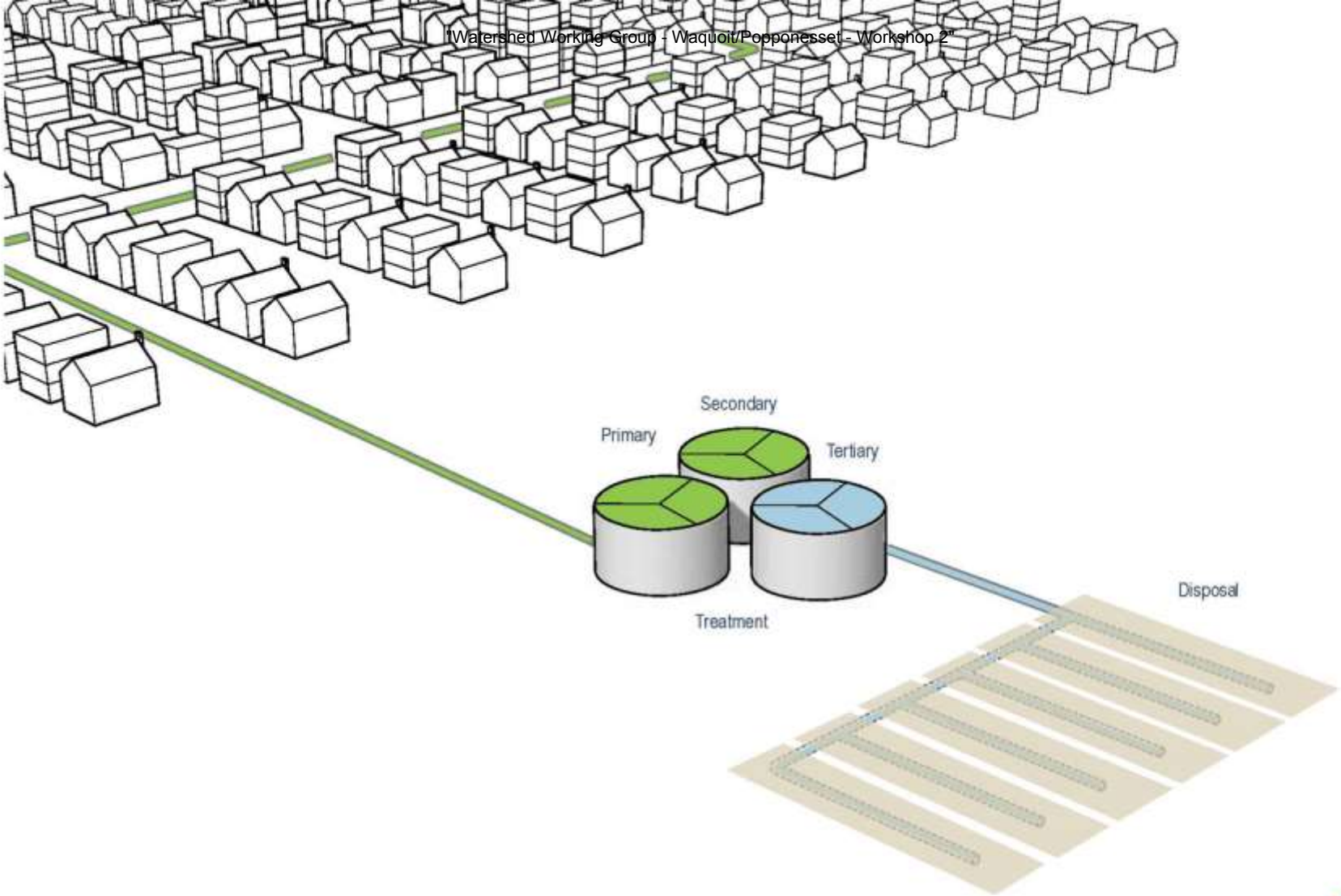


Scale: NEIGHBORHOOD
Target: STORMWATER

Stormwater Wetlands

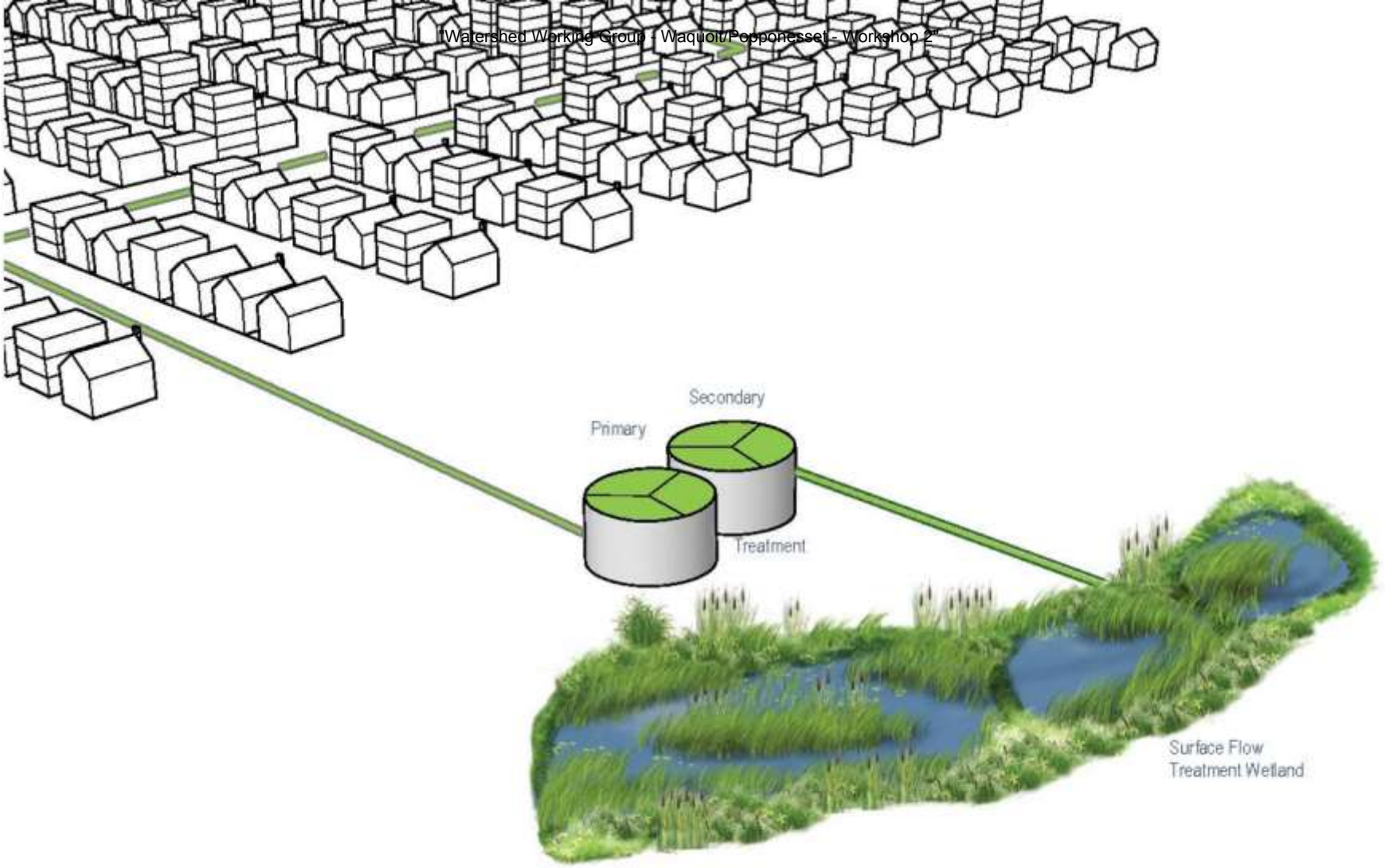
"Watershed Working Group - Waquoit/Popponesset - Workshop 2"

Solutions: Watershed



Scale: WATERSHED
Target: WASTEWATER

Conventional Treatment

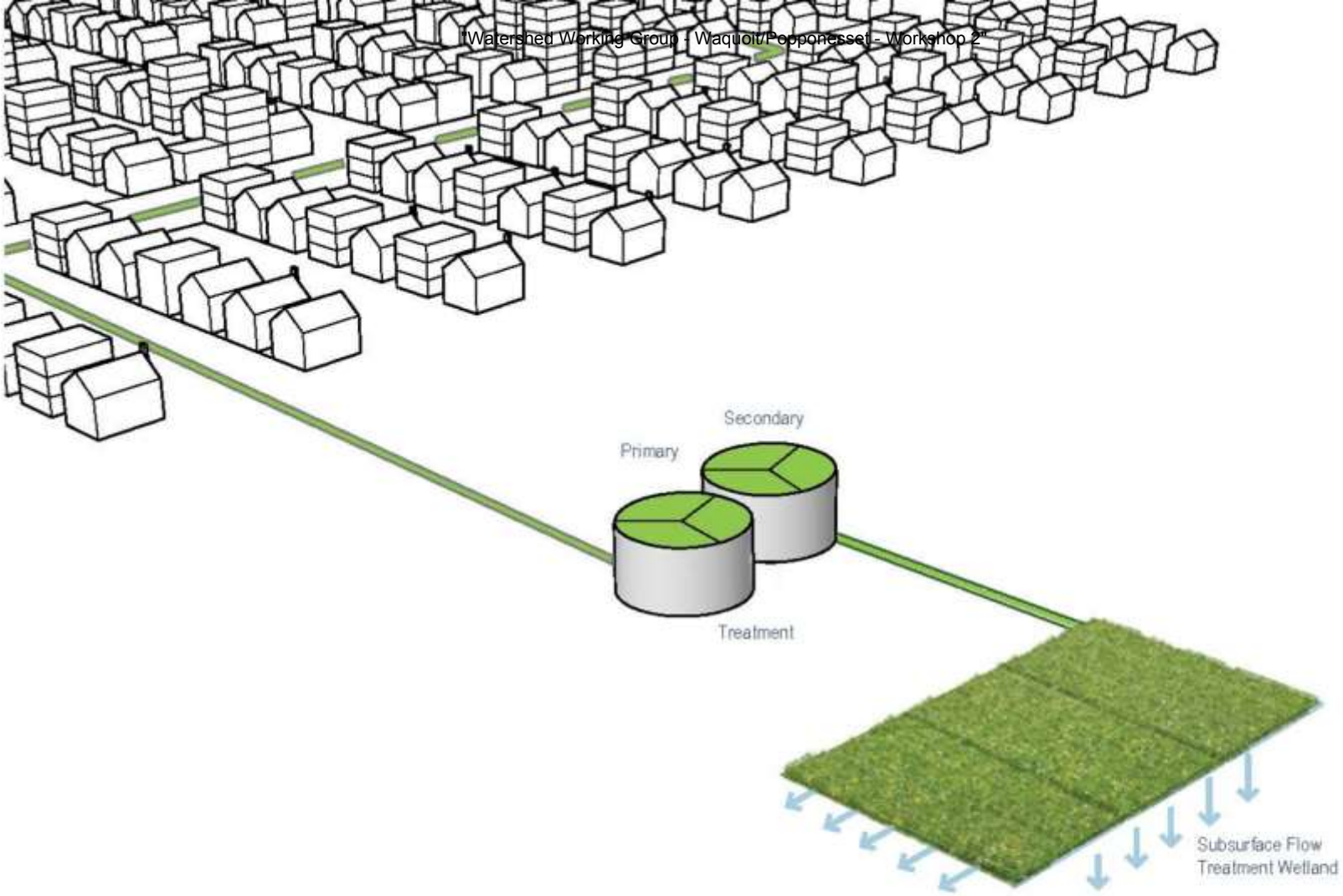


Scale: WATERSHED
Target: WASTEWATER

Constructed Wetlands:
Surface Flow

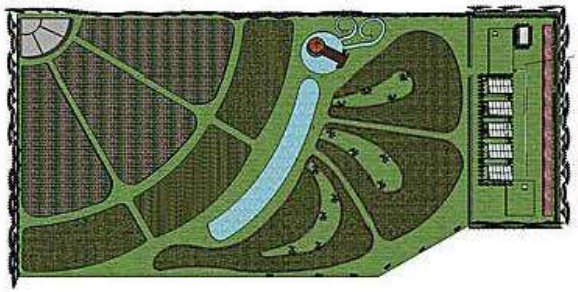
Precedent: Talking Waters Garden - Albany, OR
Source: Kate Kennen

Constructed Wetlands:
Surface Flow



Scale: WATERSHED
Target: WASTEWATER

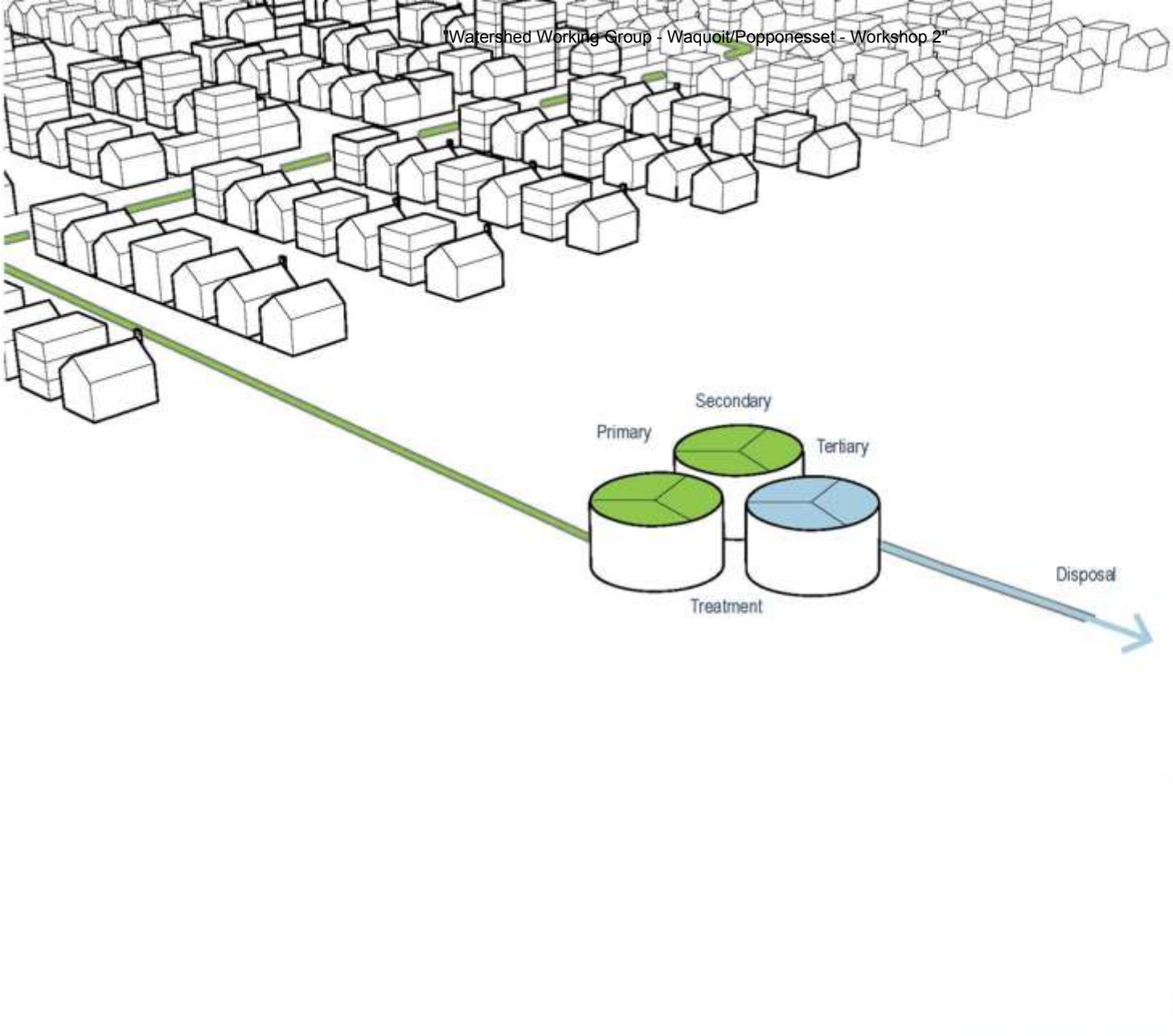
Constructed Wetlands
Subsurface Flow

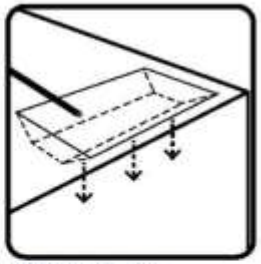


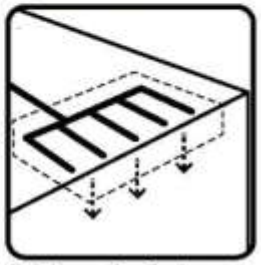
Precedent: Koh Phi Phi Treatment Wetland, Thailand

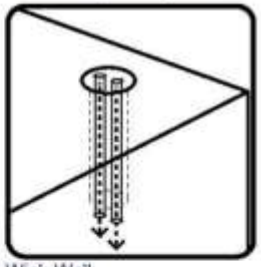
Source: Hans Brix

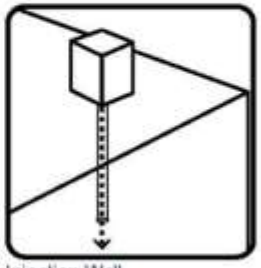
Constructed Wetlands:
Subsurface Flow




Infiltration Basins


Soil Absorption System

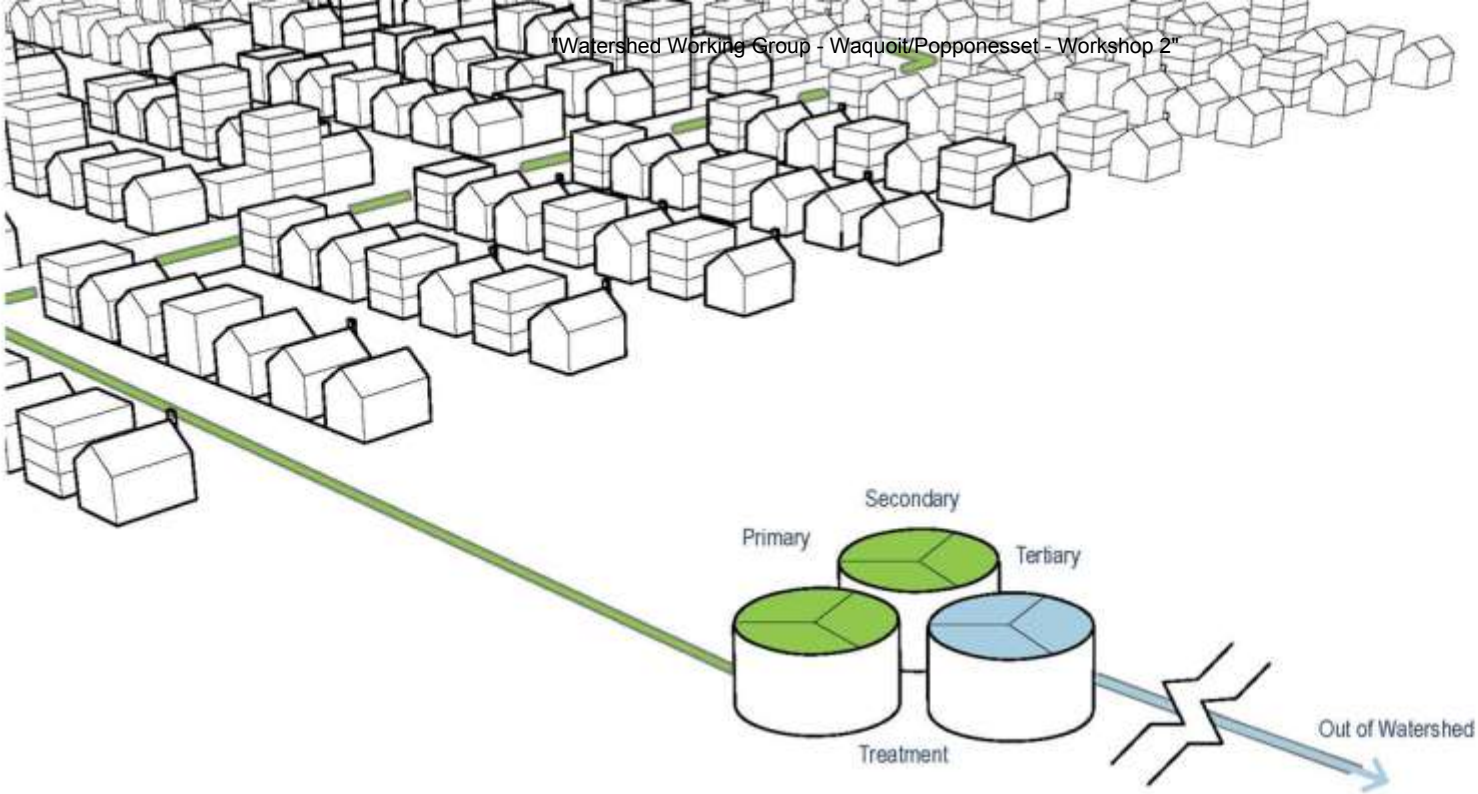

Wick Well


Injection Well

Scale: WATERSHED
Target: WASTEWATER

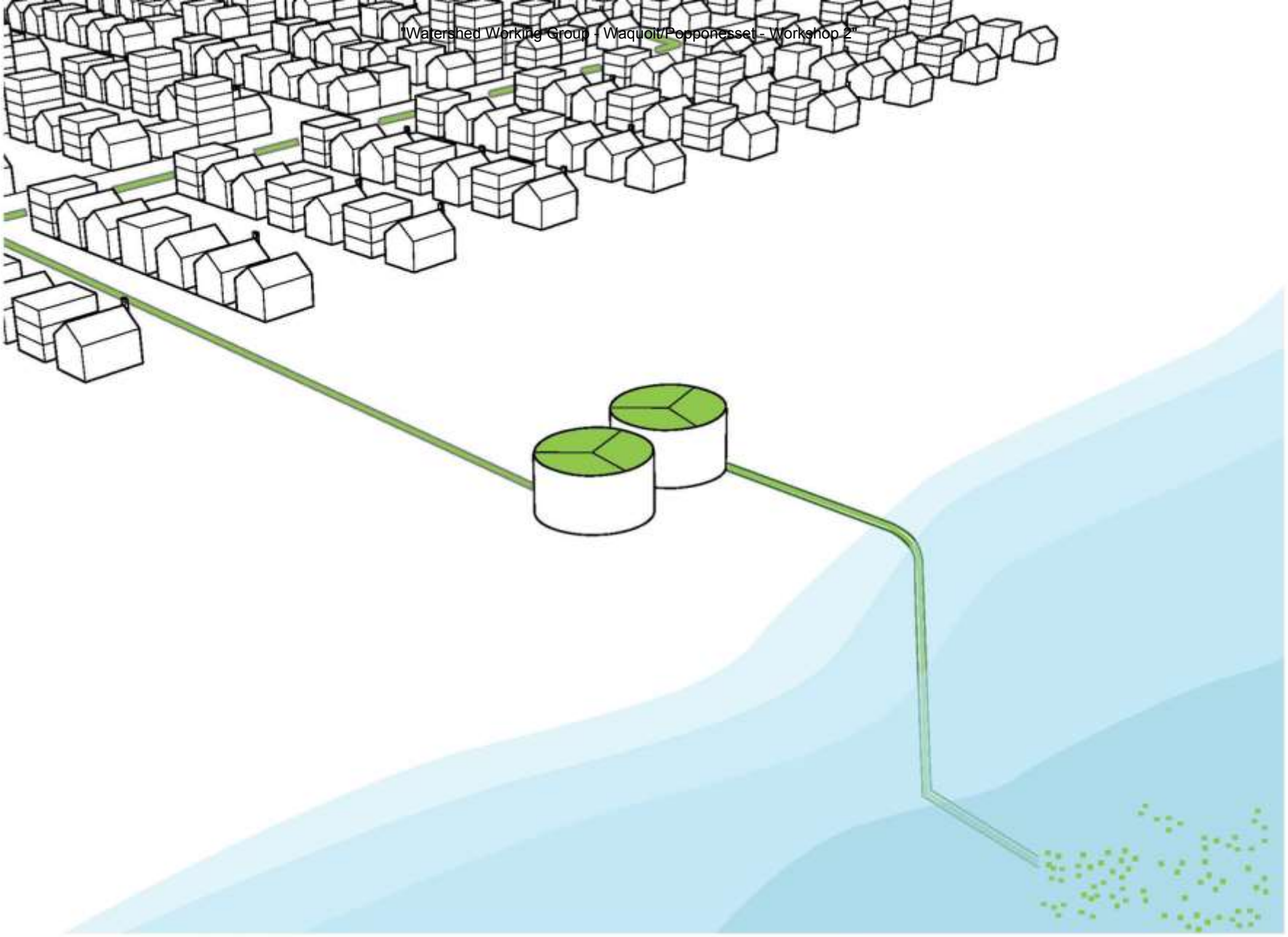
Effluent Disposal Systems

Disposal:



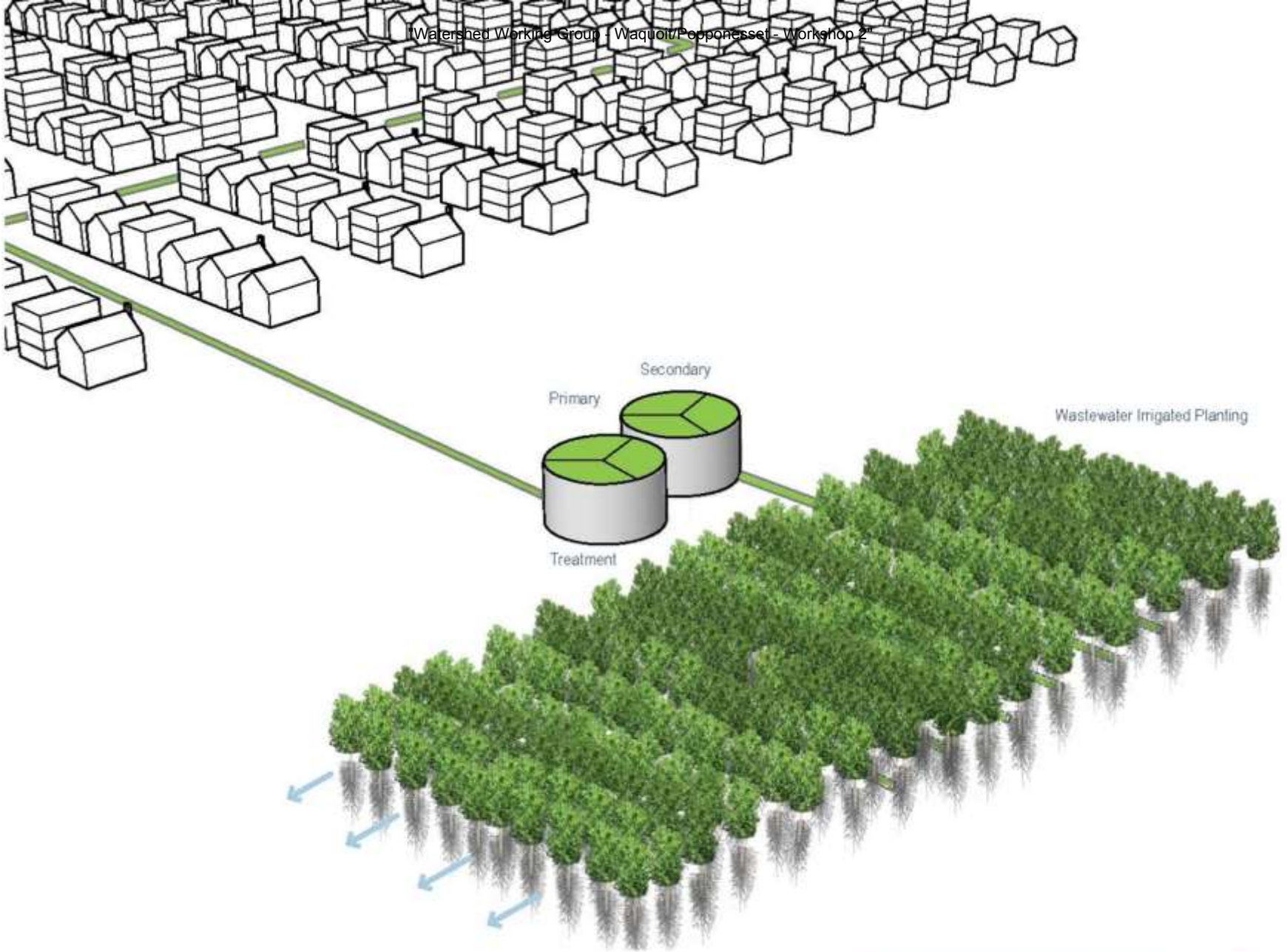
Scale: WATERSHED
Target: WASTEWATER

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

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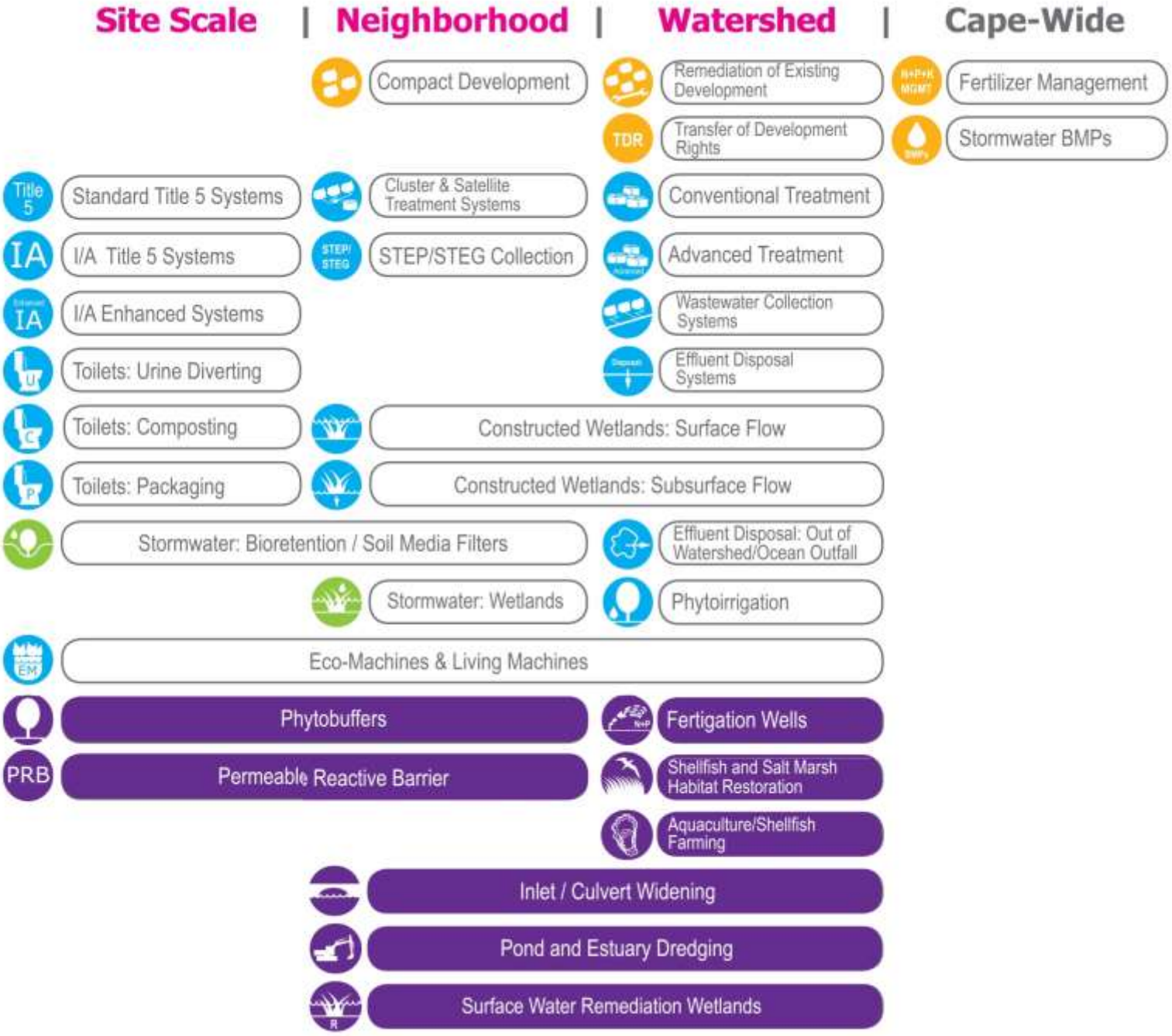
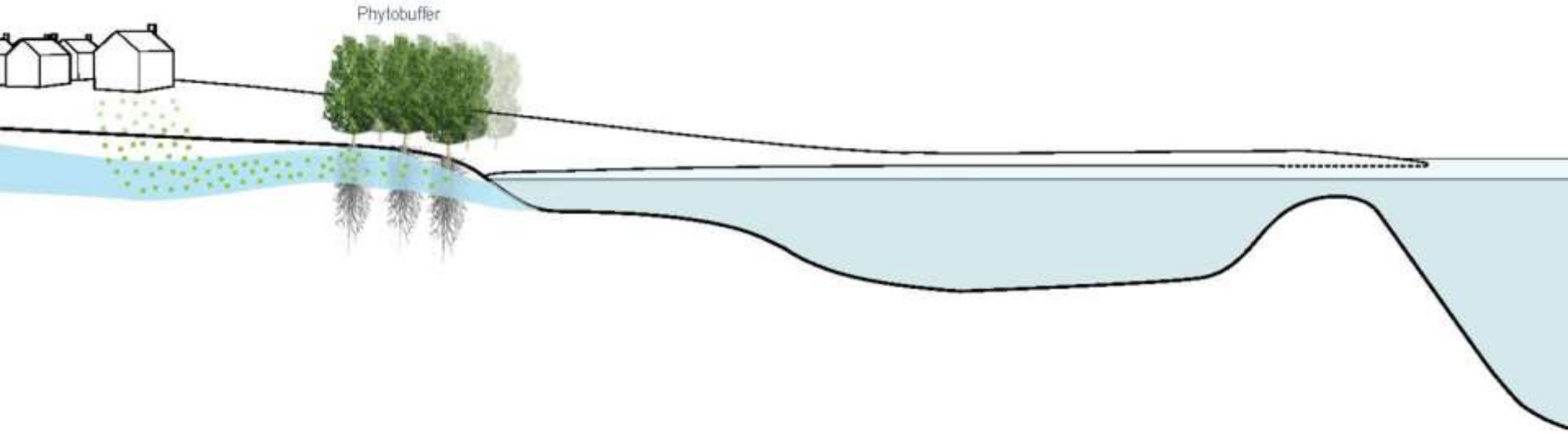
Phytoirrigation

Solutions: Ex. Water



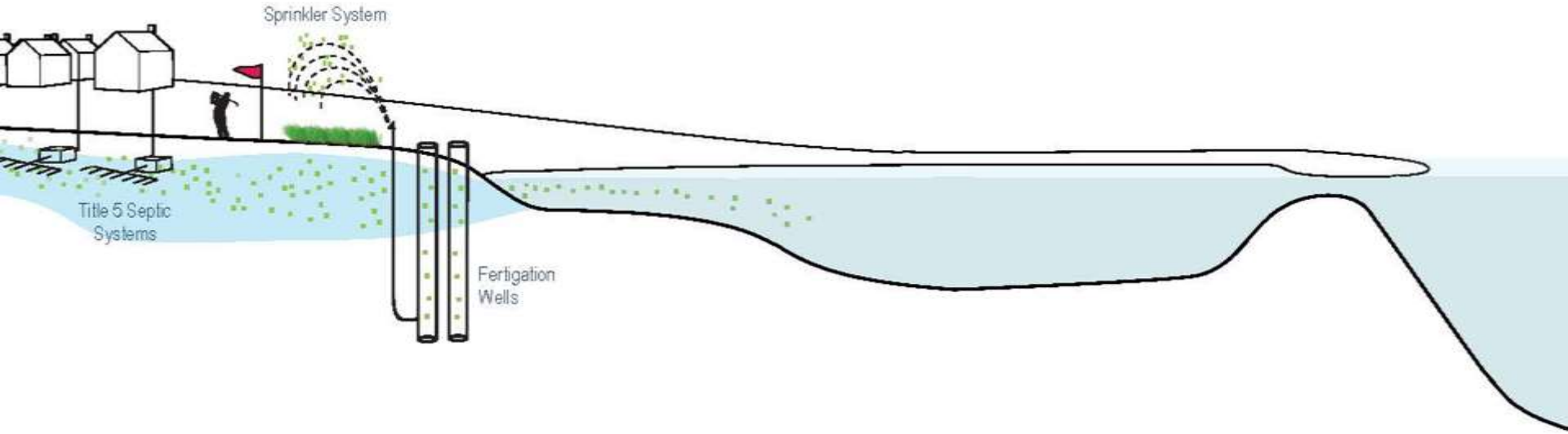


Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Phytobuffers

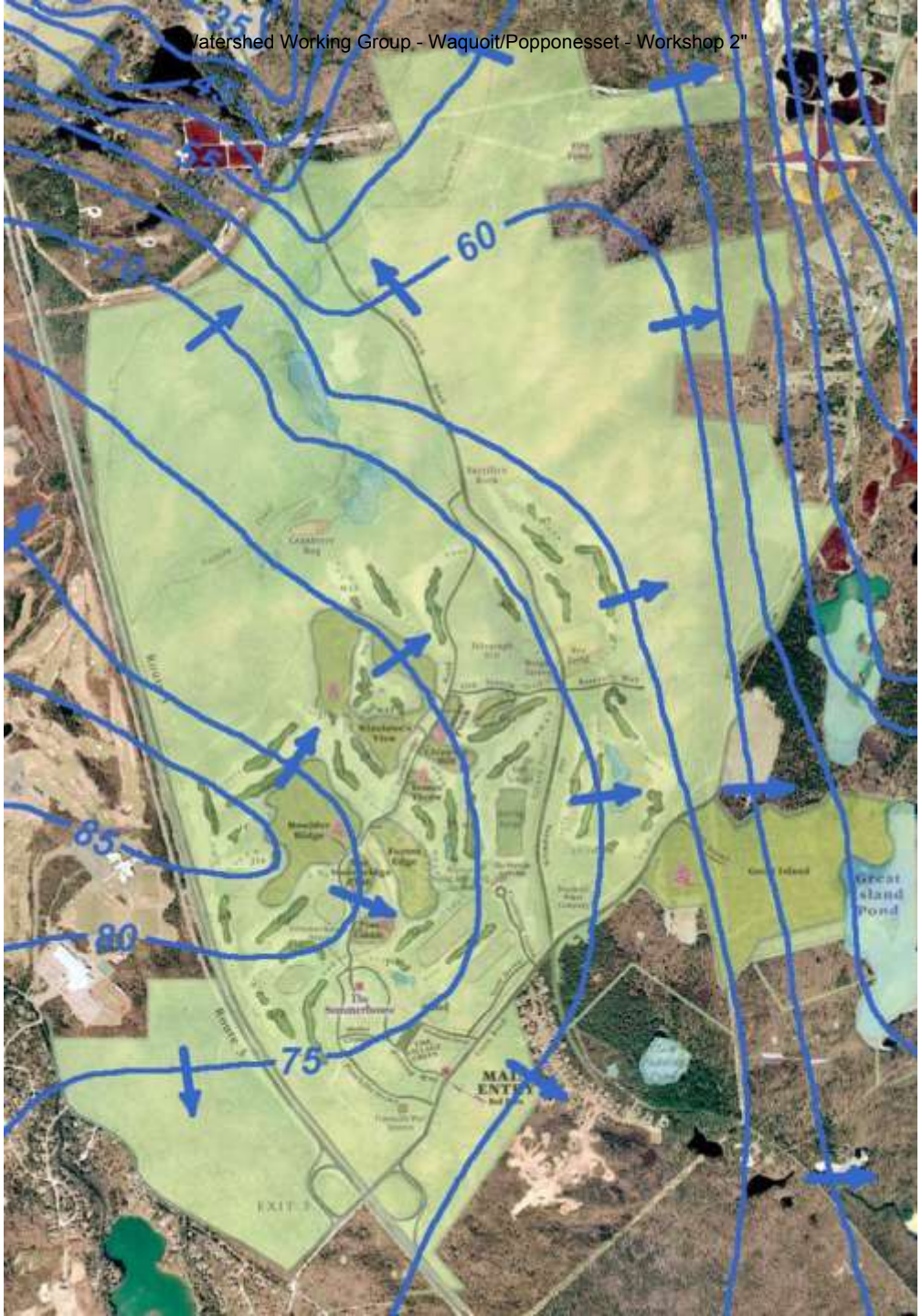
Precedent: Phytobuffer - Kavcee, WY
Source: Sand Creek Consultants

Phytobuffers

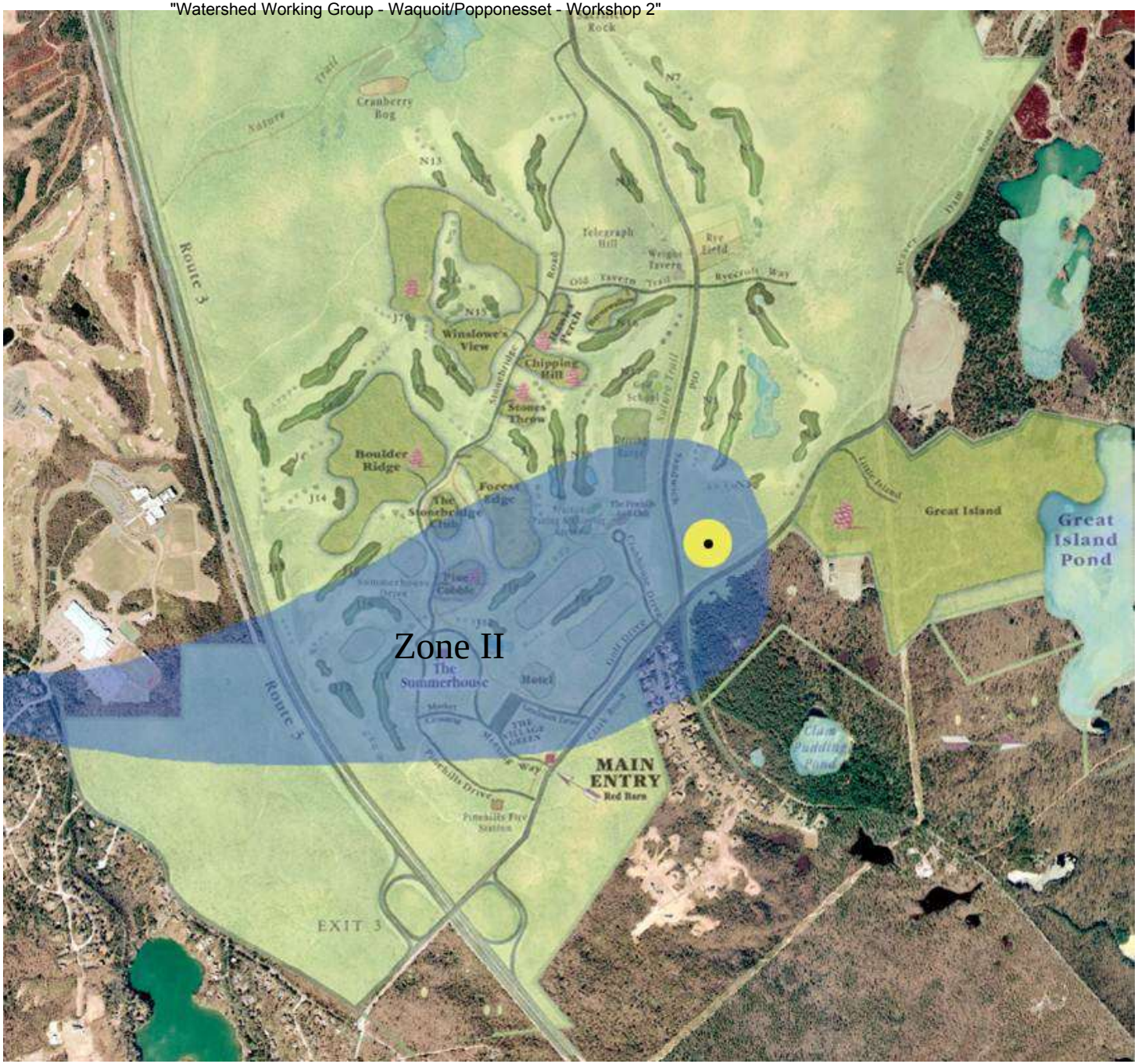


Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

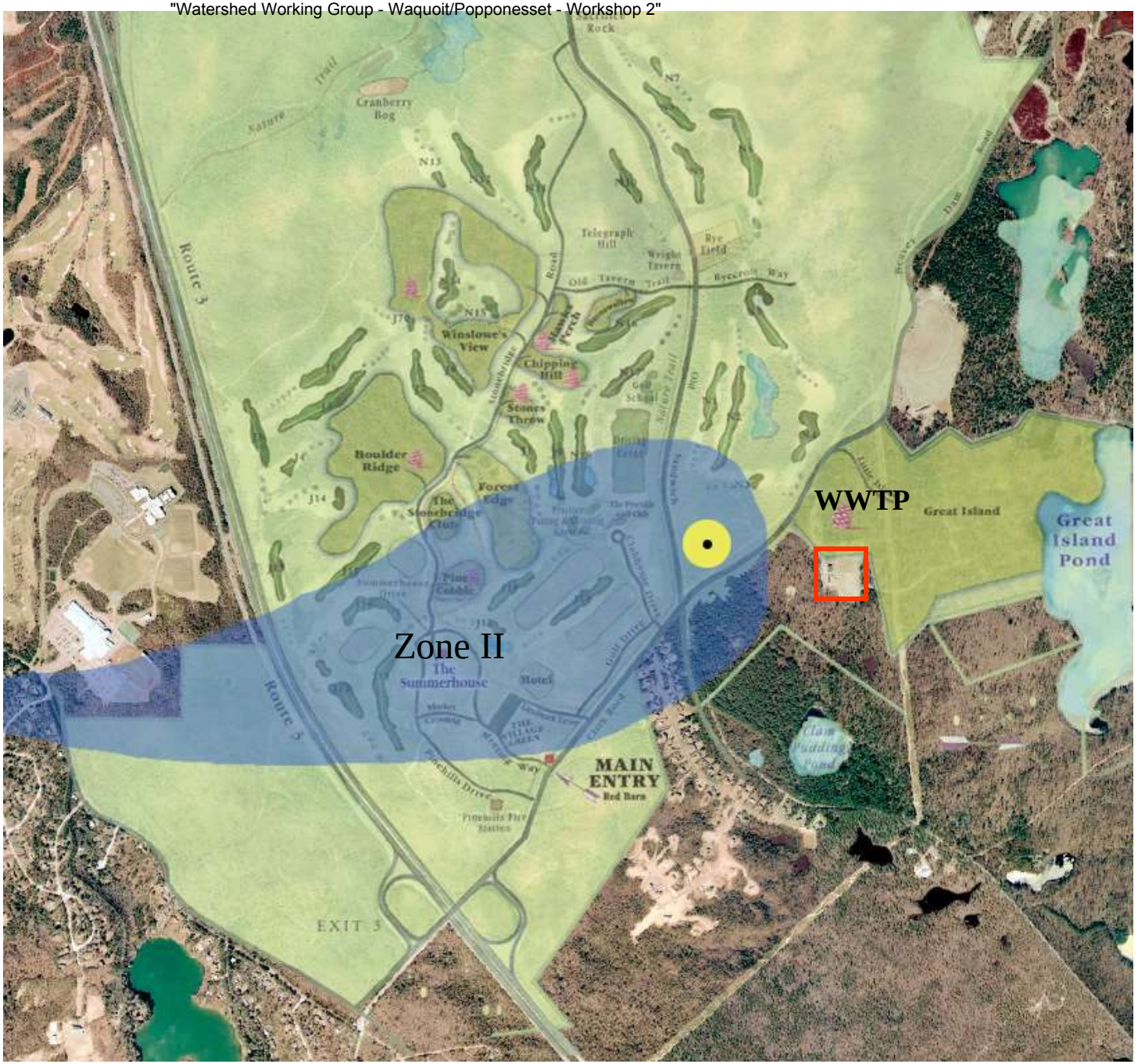
Fertigation Wells



Precedent:
Pine Hills
Plymouth, MA



Precedent:
Pine Hills
Plymouth, MA



Precedent:
Pine Hills
Plymouth, MA

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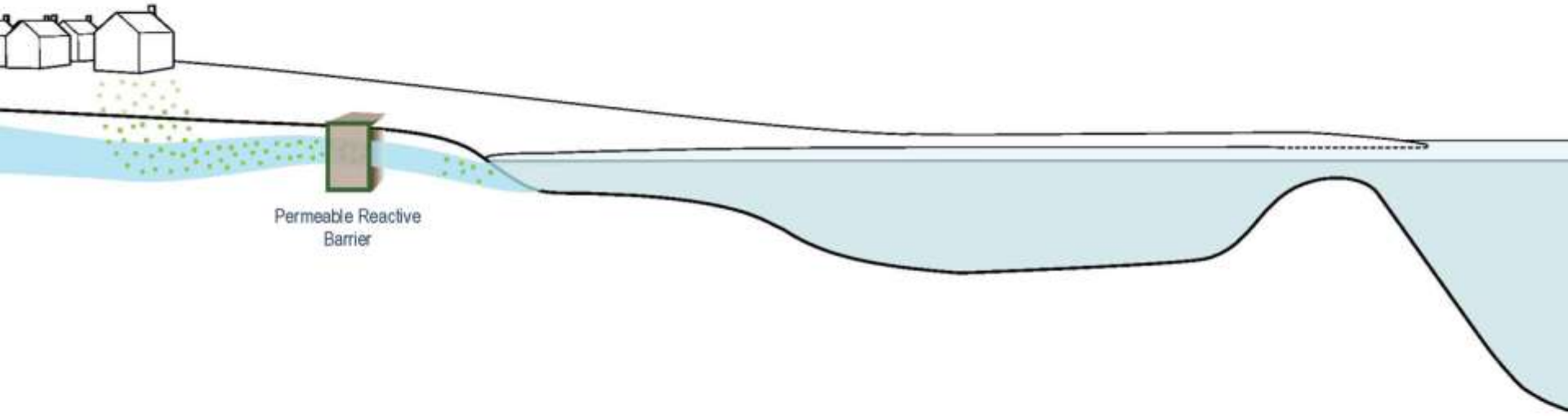
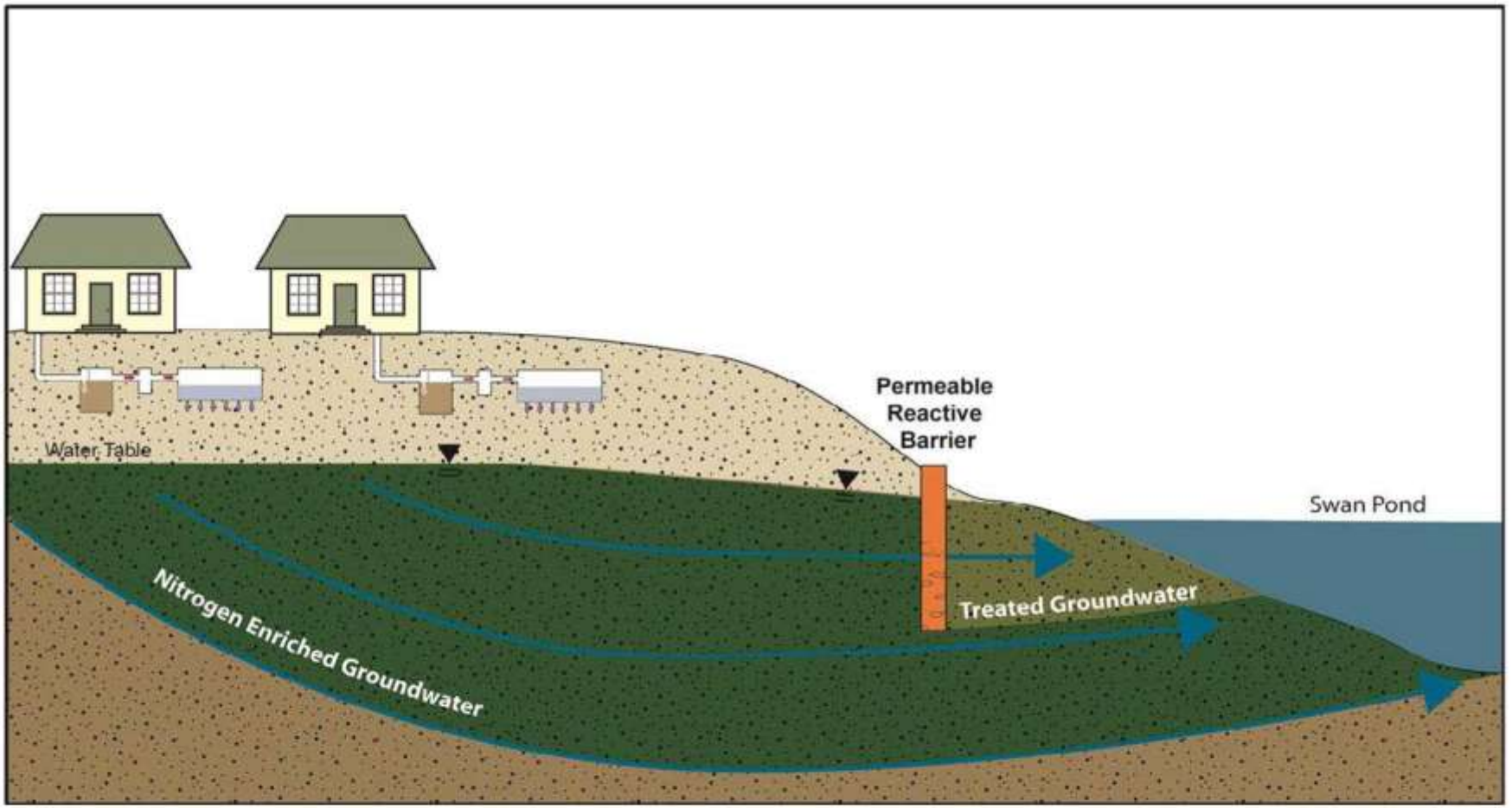
Pine Hills
Plymouth, MA



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

Permeable Reactive Barrier PRB

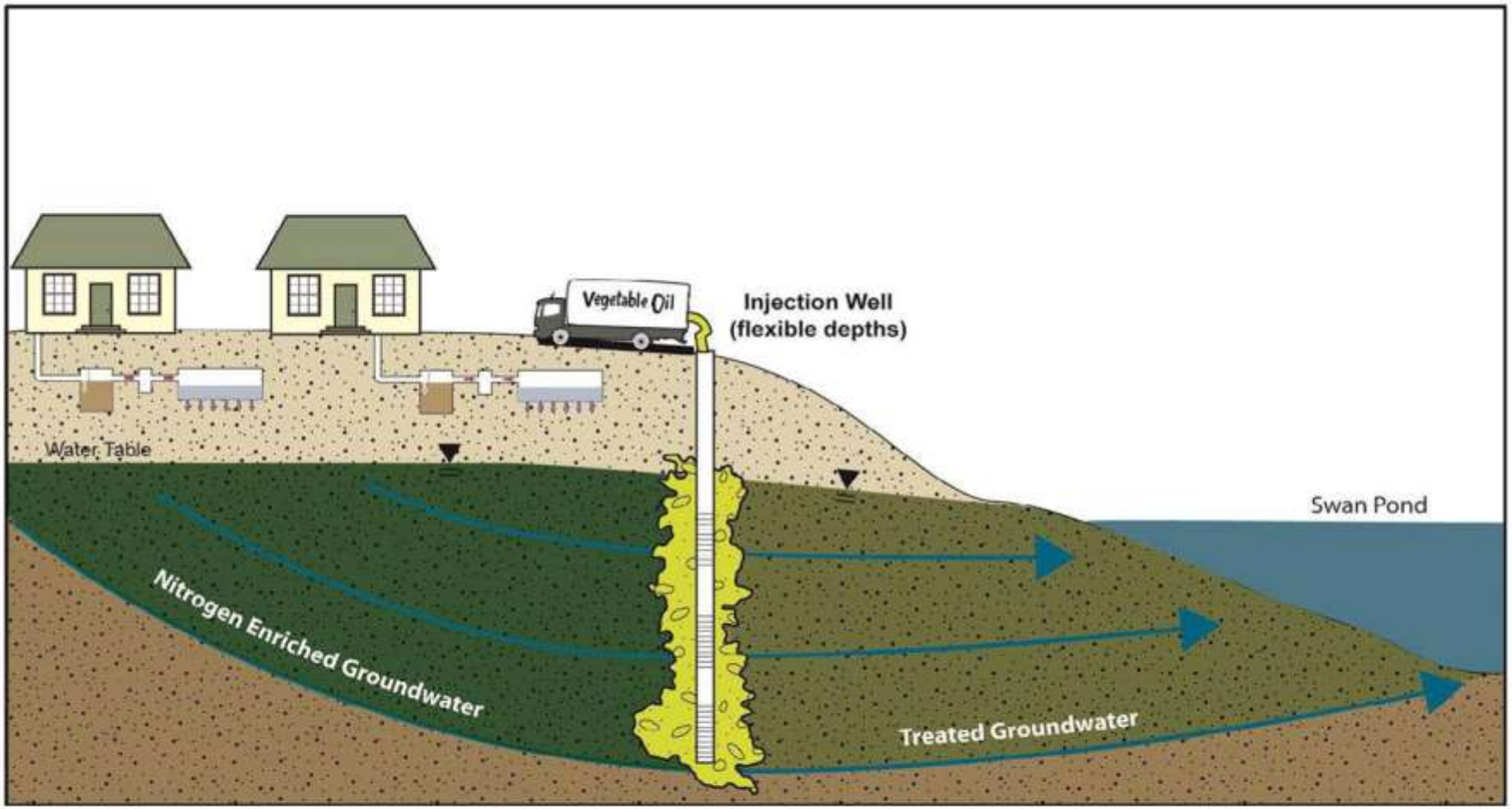


Precedent: PRB
Source: Horsley Witten Group Inc.

Permeable Reactive Barrier PRB

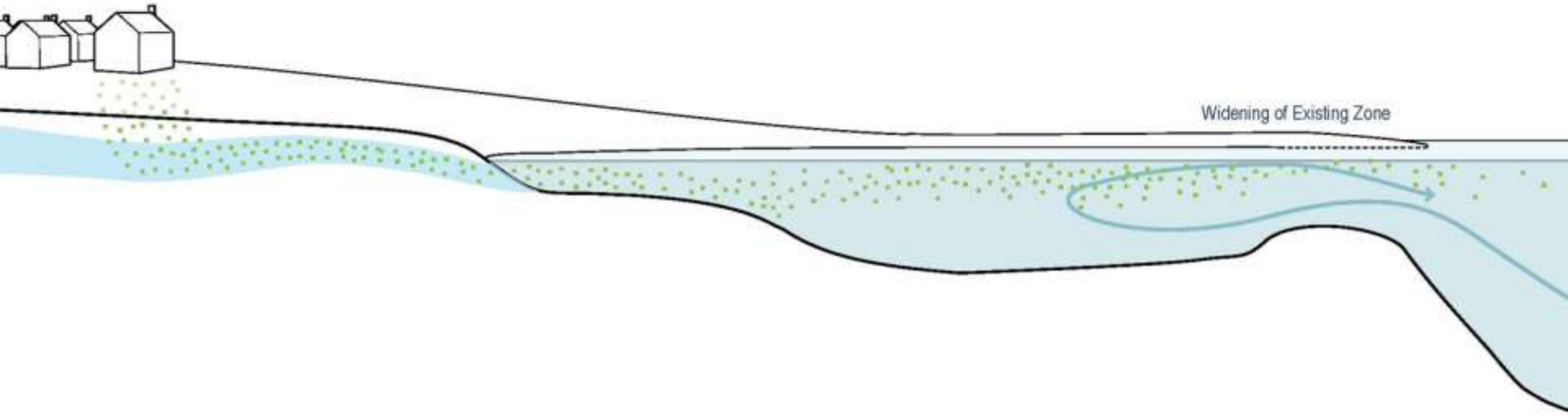
Precedent: Falmouth PRB
Source: Mike Domenica

Permeable Reactive Barrier PRB



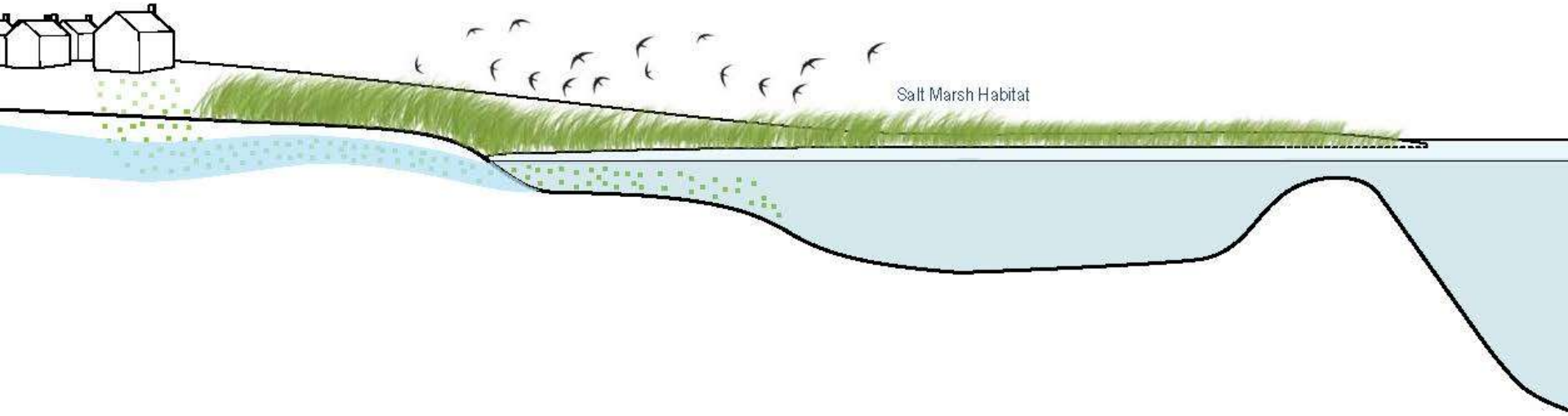
Precedent: PRB
Source: Horsley Witten Group Inc.

Permeable Reactive Barrier PRB



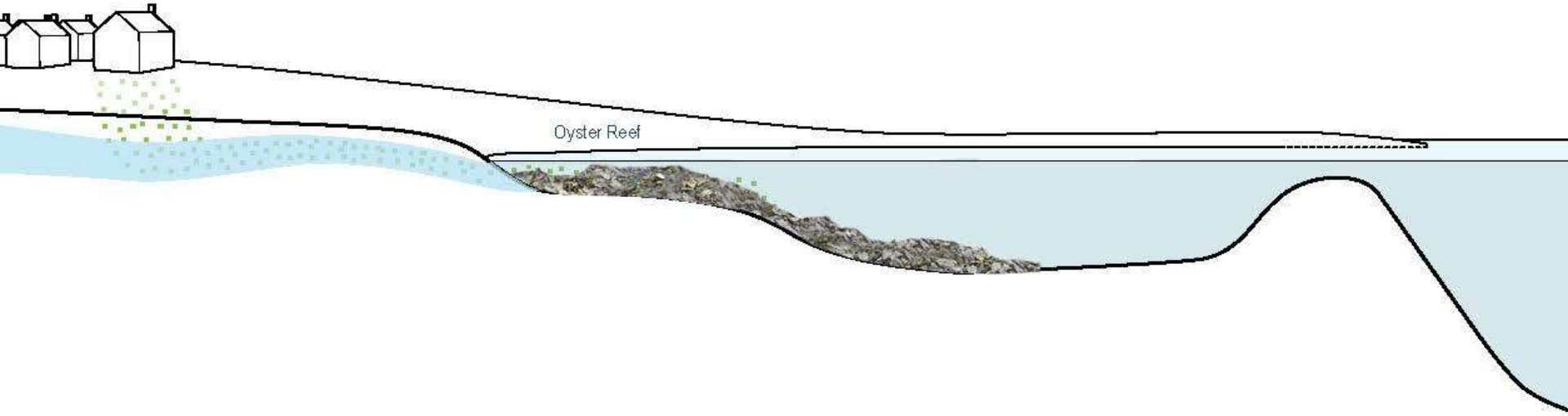
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

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

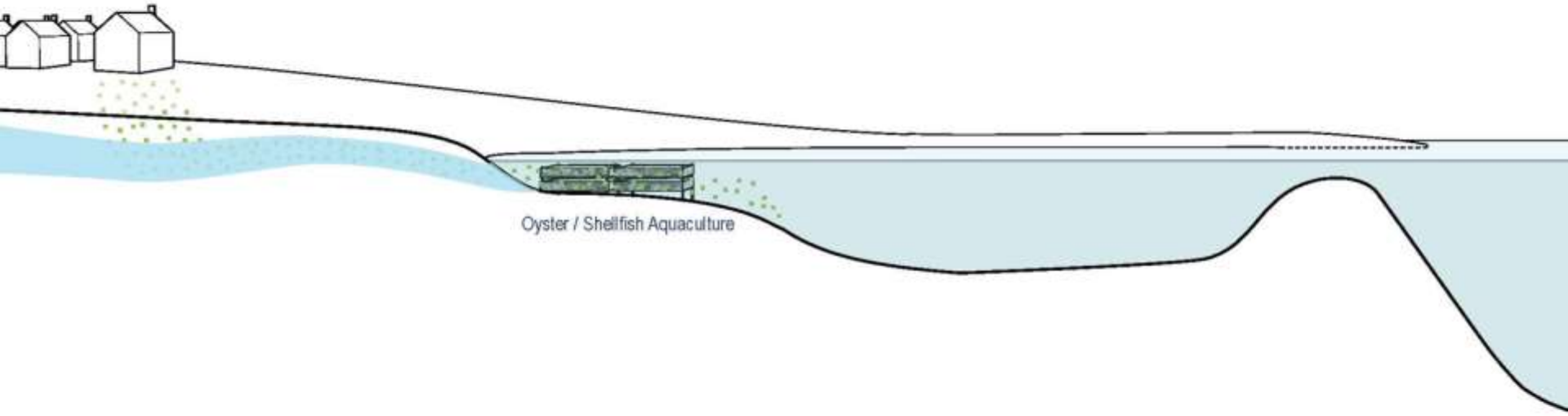
Source: Anamarija Francik

Shellfish Habitat Restoration

Precedent: Wellfleet Oyster Restoration Project

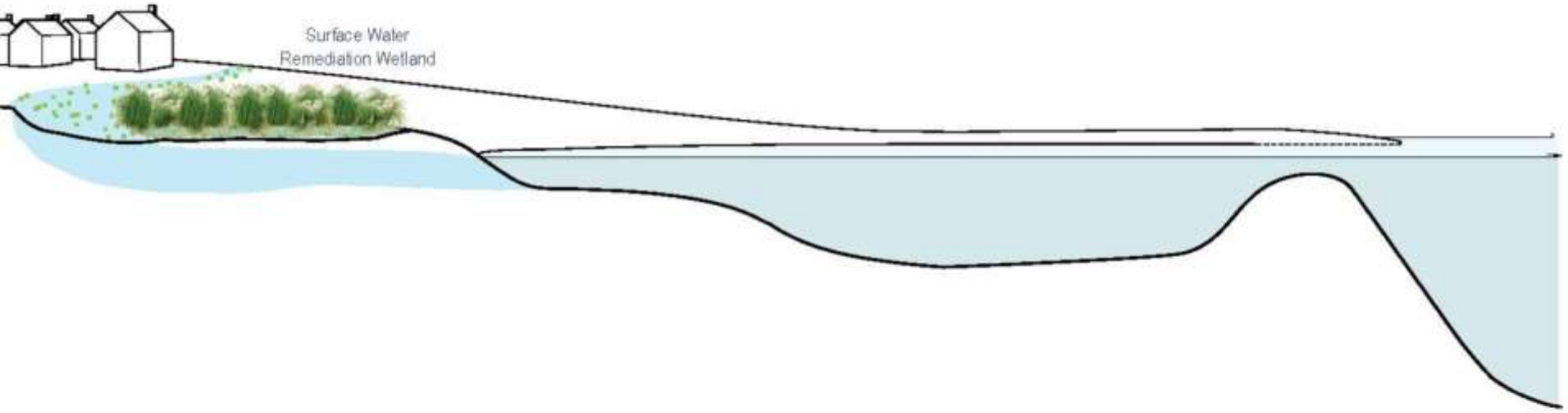
Source: Anamarija Francik

Shellfish Habitat Restoration



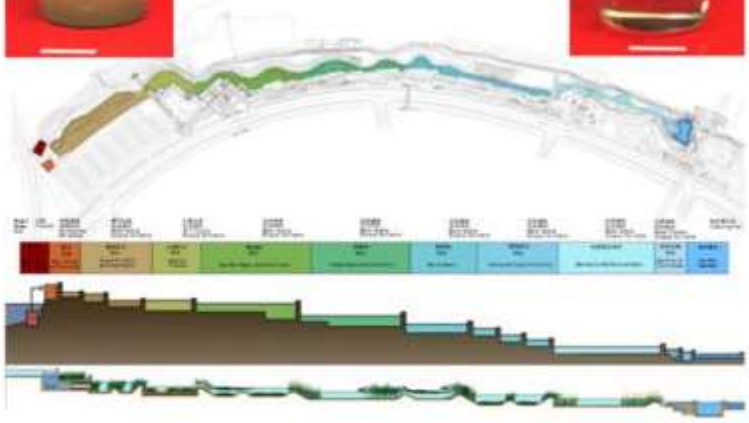
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Aquaculture / Shellfish Farming



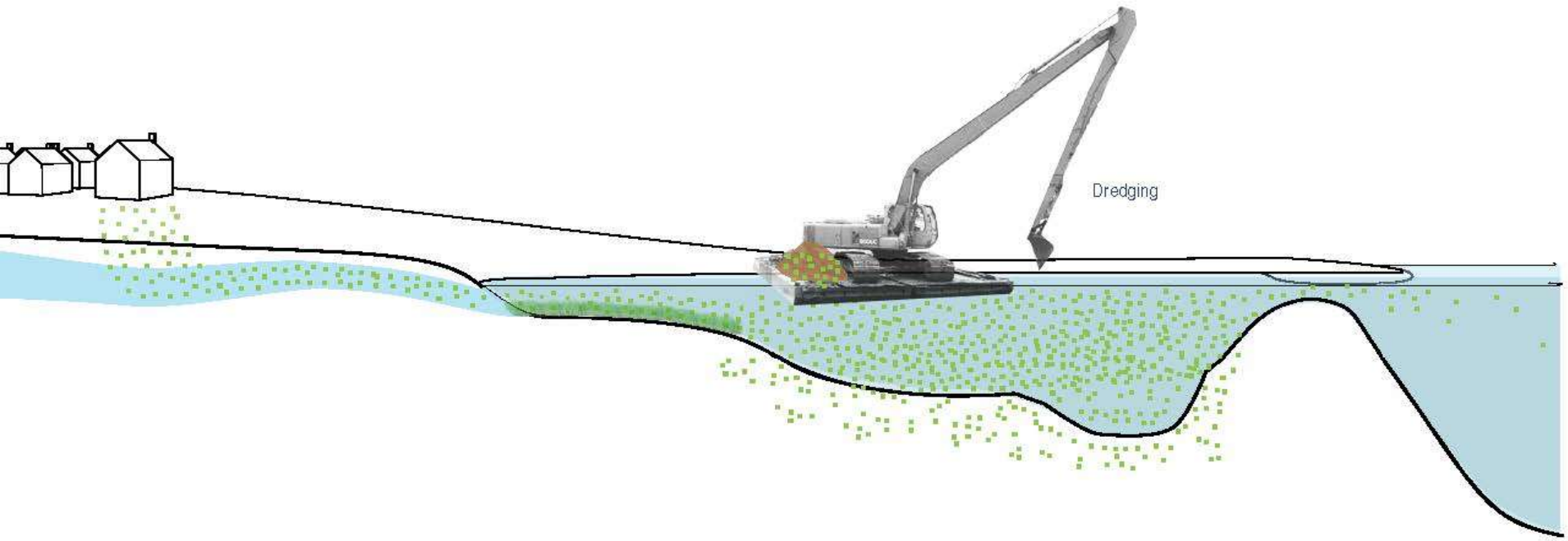
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Surface Water
Remediation Wetlands



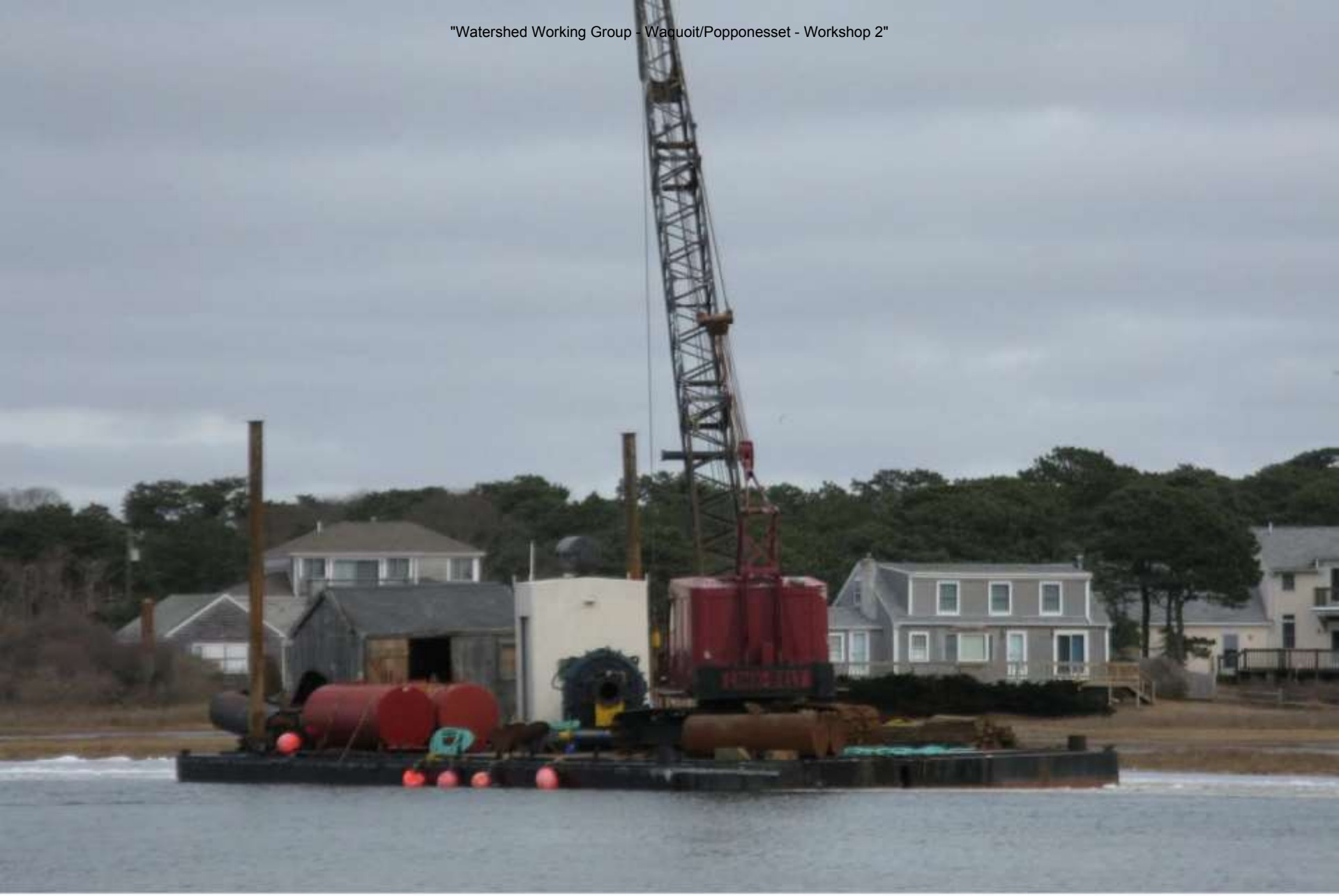
Precedent: Shanghai Houton Park
Source: Turenscape

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

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

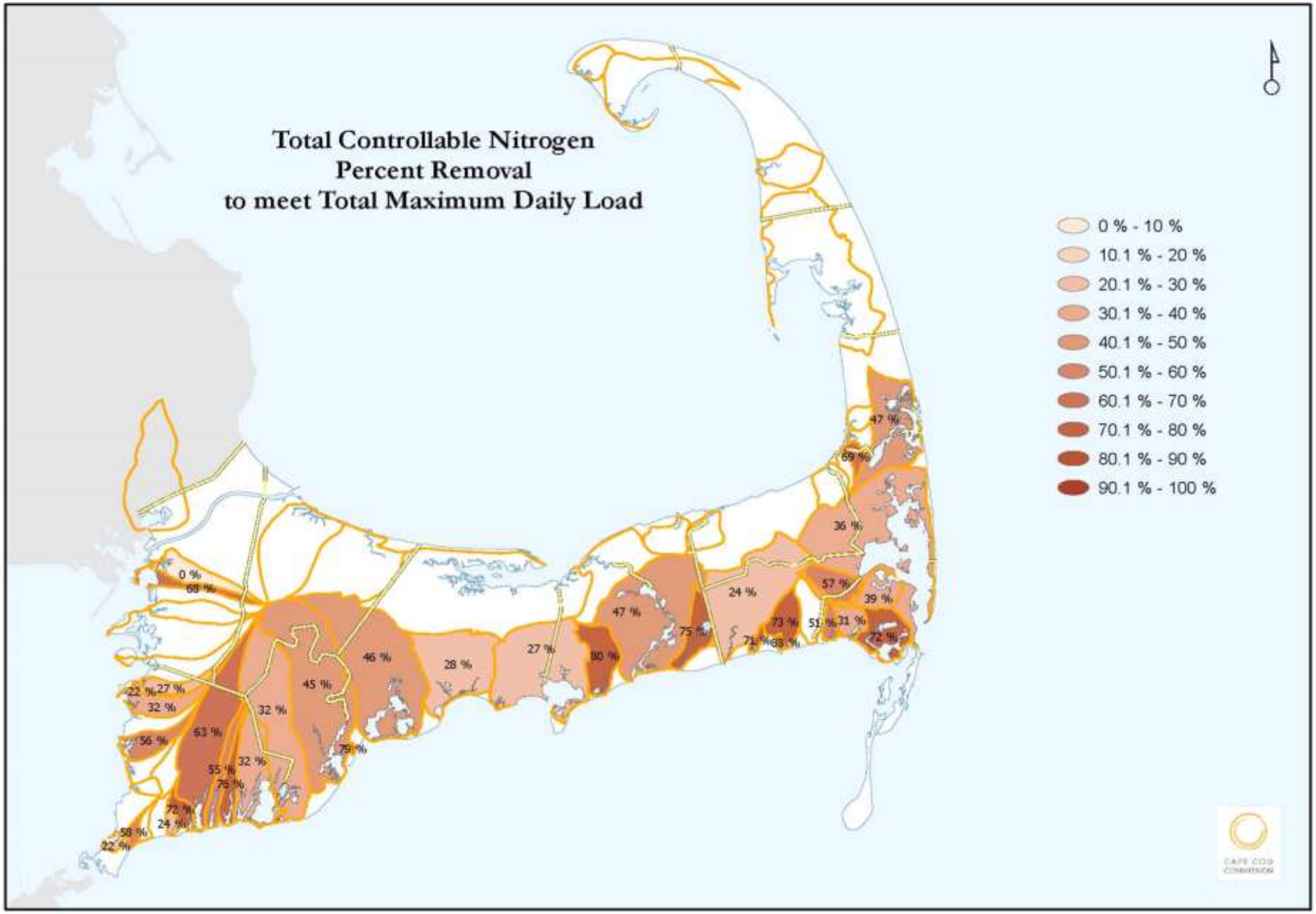
Town Consideration of Alternative Technologies & Approaches

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*

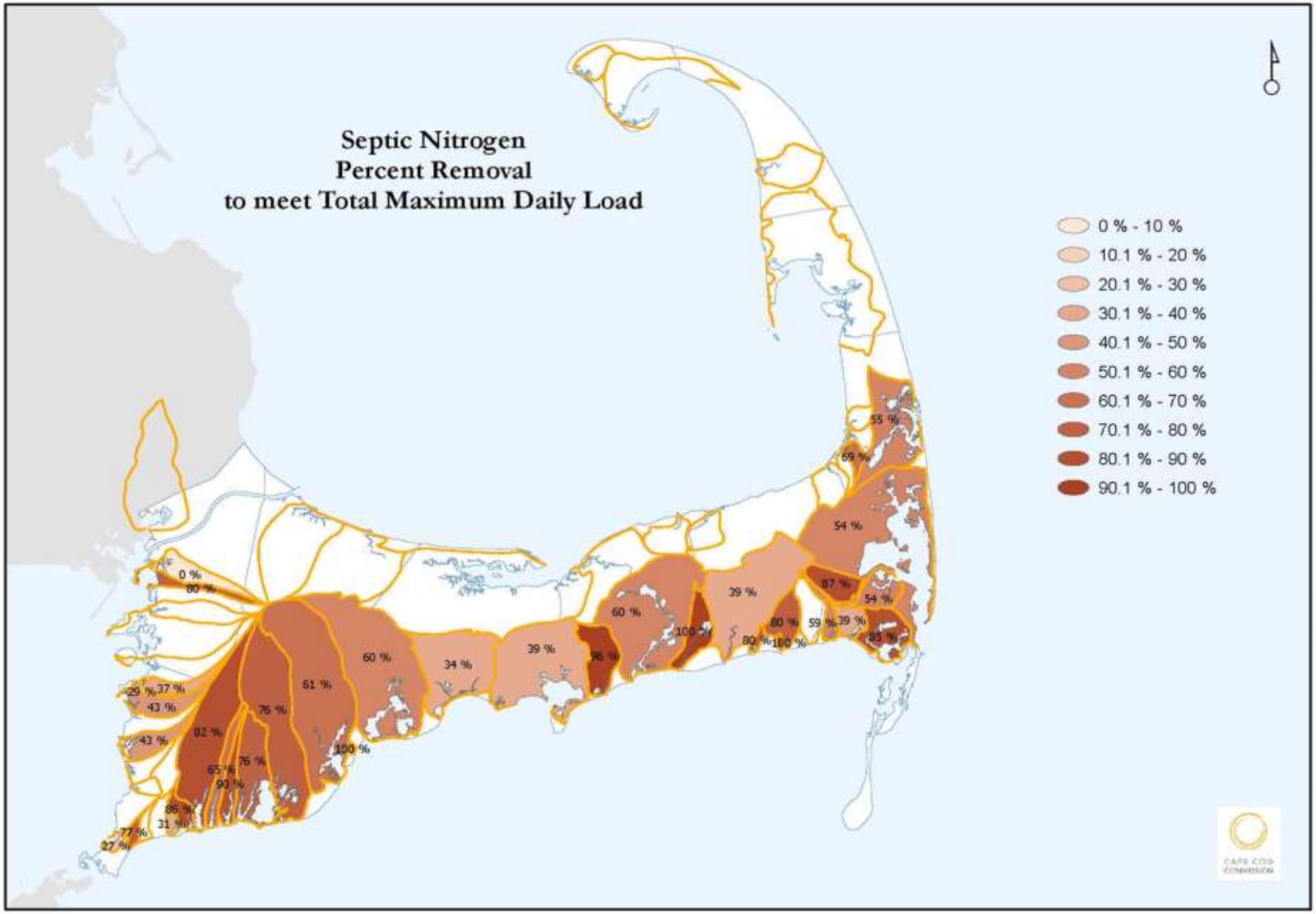

Site Scale | Neighborhood | Watershed | Cape-Wide
Solutions
Compact Development
Remediation of Existing Development
Fertilizer Management
TDR
Transfer of Development Rights
Stormwater BMPs
Title 5
Standard Title 5 Systems
Cluster & Satellite Treatment Systems
Conventional Treatment
IA
I/A Title 5 Systems
STEP/STEG
STEP/STEG Collection
Advanced Treatment
IA
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
EM
Eco-Machines & Living Machines
Phytobuffers
Fertigation Wells
PRB
Permeable Reactive Barrier
Shellfish and Salt Marsh Habitat Restoration
Aquaculture/Shellfish Farming
Inlet / Culvert Widening
Pond and Estuary Dredging
Surface Water Remediation Wetlands

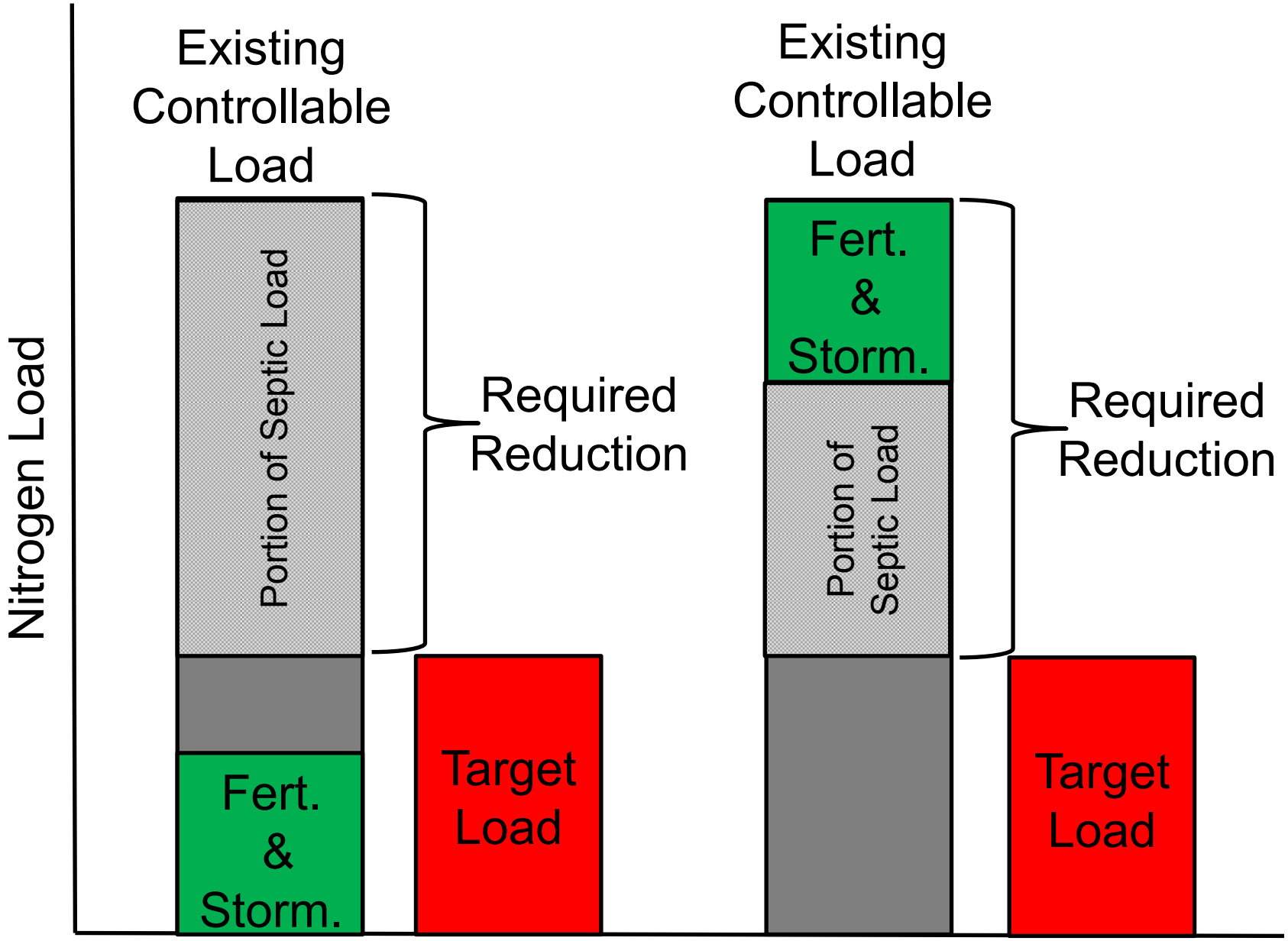

Problem Solving Approach
1
2
3
4
5
6
7
Wastewater
Existing Water Bodies
Regulatory
Targets/Reduction Goals
Present Load:
X kg/day
–
Target:
Y kg/day
=
Reduction Required:
N kg/day
Other Wastewater Management Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management
Low Barrier to Implementation
A. Fertilizer Management
B. Stormwater Mitigation
N+P+K MGMT
BMPs
Watershed/Embayment Options
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture
PRB
R
Alternative On-Site Options
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems
Title 5
Enhanced
IA
IA
Priority Collection/High-Density Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
Disposal
STEP/
STEG
Supplemental Sewering

"Watershed Working Group - Waquoit/Popponesset - Workshop 2"



"Watershed Working Group - Waquoit/Popponesset - Workshop 2"




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


Problem Solving Approach
1
2
3
4
5
6
7
Wastewater
Existing Water Bodies
Regulatory
Targets/Reduction Goals
Present Load:
X kg/day
–
Target:
Y kg/day
=
Reduction Required:
N kg/day
Other Wastewater Management Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management
Low Barrier to Implementation
A. Fertilizer Management
B. Stormwater Mitigation
N+P+K MGMT
BMPs
Watershed/Embayment Options
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture
PRB
R
Alternative On-Site Options
A. Eco-toilets (UD & Compost)
B. I/A Technologies
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D. Shared Systems
Title 5
Enhanced
IA
IA
Priority Collection/High-Density Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
Disposal
STEP/
STEG
Supplemental Sewering

Triple Bottom Line

Impacts of Technologies and Approaches

Environmental

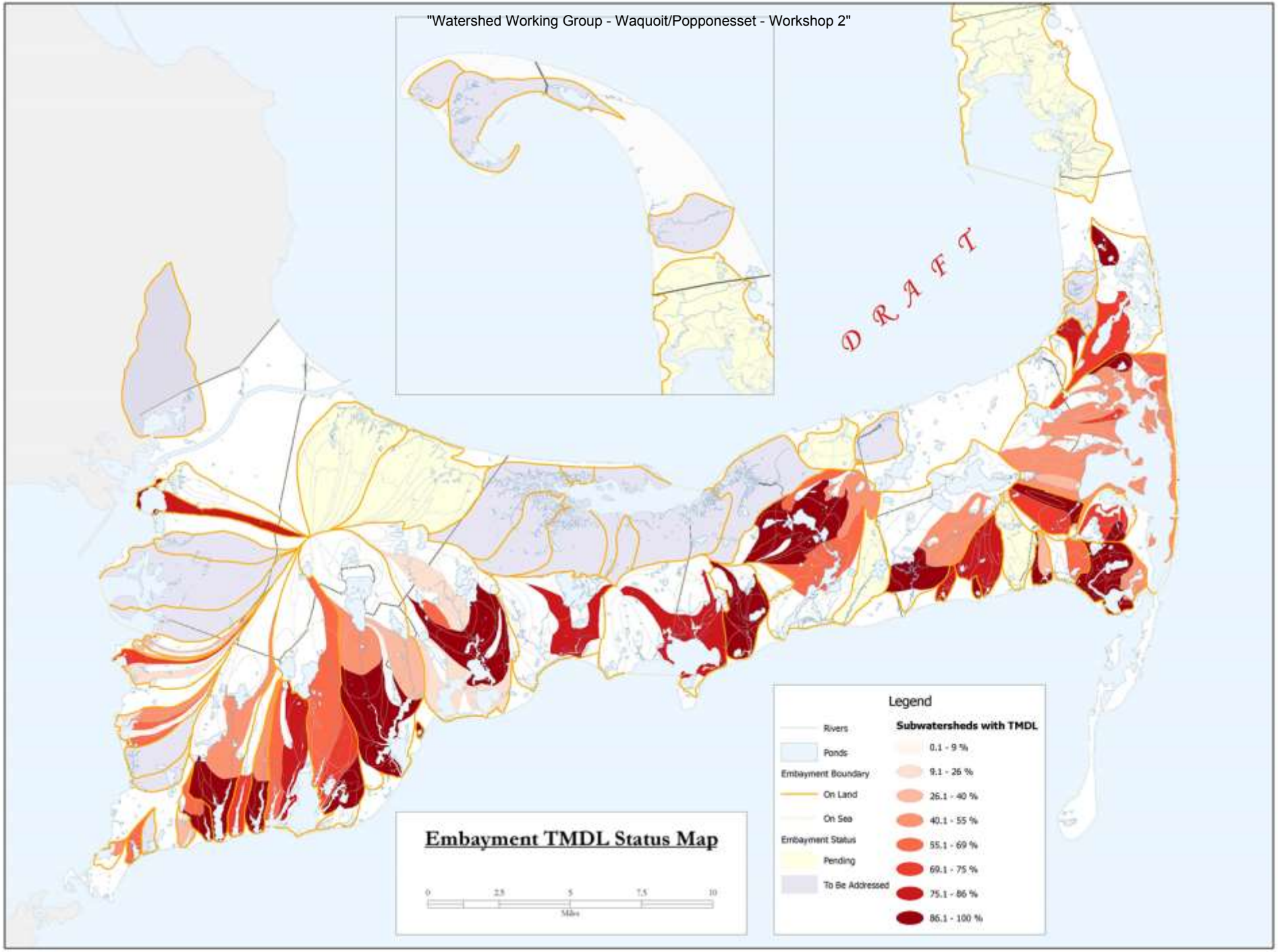
Economic

Social

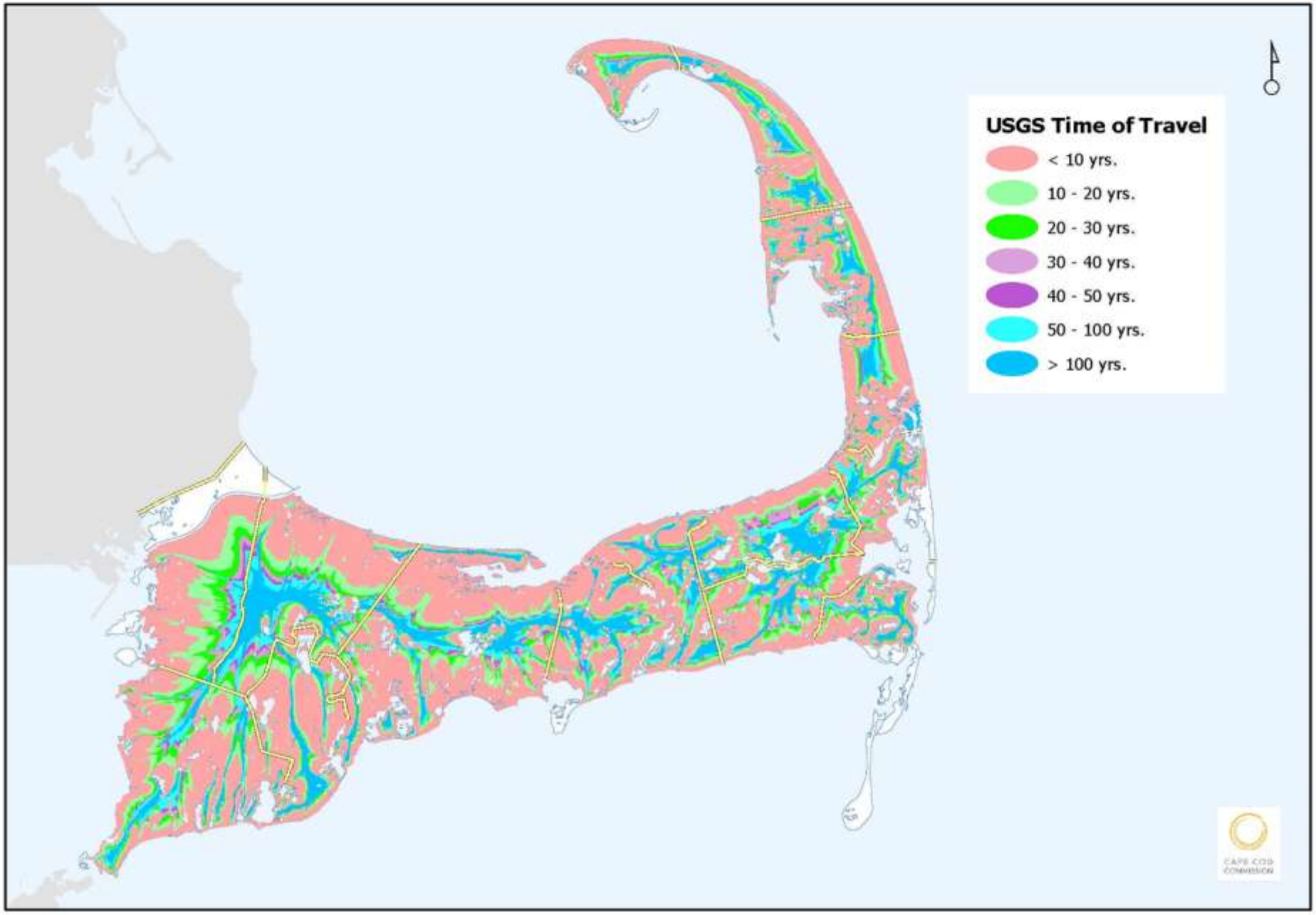
Technology Selection: Process and Principles

- 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 - Waquoit/Popponesset - Workshop 2"



"Watershed Working Group - Waquoit/Popponesset - 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
Poppenesset Bay and Waquoit Bay Watershed Working Group

Meeting Two Summary
Wednesday, October 30, 2013
1:00-5:00 pm
Mashpee Town Hall, 16 Great Neck Road, Mashpee

I. ACTION ITEMS

Working Group

- Next meeting: Meeting Three
  Wednesday, December 11, 2013
  1:00PM – 5:00PM
  Mashpee Town Hall, 16 Great Neck Road North, Mashpee
- Send Doug any additional comments on Meeting One Summary within one week
- Continue to prepare thoughts about preferred technologies/approaches for application in the Poppenesset Bay and Waquoit Bay Watershed. Different scenarios and options will be discussed during the third meeting
- Review the information from the funding workshop that the commission ran earlier this year.

Consensus Building Institute

- Send link with presentation to participants
- Finalize Meeting One summary
- Draft and solicit feedback from Working Group on second meeting summary

Cape Cod Commission

- Share Technology Matrix with Working Groups
- Share updated chronologies with Working Groups
- Send invite for November 13th meeting, including whether there will be food and how long it is anticipated to go
- Send directions for accessing GIS layers to all participants
- Identify location of I/A Title V systems on a GIS layer
- Confirm where wood chips are placed in subsurface nitrogen removal septic systems and notify interested stakeholders
- Add existing stormwater utility map information to 208 Plan Reference Map
- On slide for effluent disposal, show that water receives tertiary treatment before it goes out to the ocean.
- Add sustainability concerns to the Technology Matrix.

Things for the Cape Cod Commission to Consider

- Consider preparing models and guidelines that municipalities can use when working with contractors to install and use technologies and approaches
- Consider educating town decision-makers about TMDLs and the process for ensuring compliance with water quality standards
- Consider vacuum collection systems along with STEP and STEG systems.
- Consider indicating effectiveness in dealing with chemicals of emerging concern on Technology Matrix.
- Consider modifying the 7-Step Problem-Solving Process diagram to clarify interventions of different types (such as conventional sewering and alternative technologies) should be considered and implemented simultaneously.

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

Ms. Kristy Senatori, Deputy Director at the Cape Cod Commission (the Commission), welcomed participants and offered an overview of the 208 Plan Update stakeholder process. 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. Second meetings of the Watershed Working Groups are underway and will focus on exploring technology options and 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 Technical Advisory Committee of the Cape Cod Water Protection Collaborative and 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. Once it is finalized by the Cape Cod Commission, the Technology Matrix will be shared with Working Group Members.

Ms. Senatori shared the progress of the Commission's 208 Plan team since the first meeting which includes:

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

Ms. Senatori announced that there would 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: a wrap up of the "Cape2O: ur in charge!" game; a summary of the planning process to date; and a discussion of the role of stakeholders in the second 6 months of the 208 planning process

Ms. Senatori then officially 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.

Ms. Patty Daley, Deputy Director at the Cape Cod Commission and Area Manager for the Working Group, asked whether anyone had tried to access the online GIS layers.

- A couple participants indicated they have had trouble accessing the data layers.
- Ms. Daley, said that the Commission would be sending around directions for accessing GIS layers to all participants.

Mr. Thompson, the facilitator from the Consensus Building Institute, then reviewed the agenda and led participant introductions. A participant list is found in Appendix A. He also recapped what this meeting and upcoming meetings would be covering and reminded participants about the protocols that had been agreed upon during the previous Working Group meeting.

He also thanked participants for their feedback on the draft meeting notes from the first meeting, and reminded participants to look over these and provide feedback if they haven't already.

III. RANGE OF POSSIBLE SOLUTIONS

Ms. Daley led a discussion of the range of possible solutions that could be implemented as part of the 208 Plan. She encouraged Working Group participants to keep the following points in mind as they learn more about these possible solutions and consider the pros and cons of each technology and approach:

- The Commission has engaged in a comprehensive analysis of nutrient control technologies and approaches. This analysis is distilled into "Technology Fact Sheets," which present information on the various technologies being considered and the Technology Matrix, which includes additional information on site requirements, construction, project and operation and maintenance costs, reference information, and regulatory comments.
- The Commission will be soliciting 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.
- 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.
- The third meeting will embark on hands on problem solving in each watershed to meet target load reductions. This current meeting is intended to explore the possible solutions, their pros and cons, and the public acceptability of these options.

Ms. Daly asked the stakeholders to identify promising approaches and to provide feedback on the public acceptability of each option during today's meeting.

Technologies and Approaches for Improving Water Quality

Ms. Daly began by discussing technologies and approaches for improving water quality. Ms. Daley offered a brief overview of the technologies and approaches. The following section briefly describes each technology, categorized by the scale of intervention. 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).

- 85 percent of wastewater flow in Cape Cod is through backyard Title V systems.

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.

- Ms. Daly noted that there are about 1500 of these systems throughout the Cape; the Commission is trying to identify the location of these and put them on a GIS layer.

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 for conversion to fertilizer. The remainder of human waste and water from all other household uses, such as grey water from sinks and showers,

continue to go to the septic system. Urine diverting toilets can remove significant quantities of nitrogen from the watershed (Example case: Falmouth).

Composting toilets: Composting toilet systems separate human waste from shower, sink, and other household water uses. 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 toilets as well as sufficient space in the basement for a container to capture and compost human waste. Household water use (such as from sink and shower uses) continues to flow into the septic system. (Example case: Falmouth).

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 by a service company when full. The servicing company that picks up the packages can recycle the nutrients in the human waste. This is a waterless system

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 under-drain/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. (Example case: Portland, OR).

Ms. Daly noted that all of urine-diverting toilets, composting toilets, and packaging toilets require some input and effort on the behalf of homeowners.

Participants were then asked to ask questions and share comments on these technologies.

- *One participant asked whether "eco-toilets" are waterless or if they use water.*
    - The technical experts from the Commission said that it depends. These toilets can be either waterless or use water. Either way, homeowners will still need a septic system for all other gray water, such as water from sinks, dishwashers, and clothes washers.
- *Another participant asked whether the Commission has nitrogen removal numbers for certain technologies.*
    - Ms. Daly noted that there is a column in the technology matrix that lists nitrogen removal and also encouraged him to look at the references for the technology matrix, suggesting these may be helpful for this.
- *One participant asked whether bioretention-like approaches could be used at a larger scale (e.g., neighborhood)*
    - Ms. Daly explained that they can be and that such approaches will be discussed later in the presentation.

- *A participant said he would like to see reuse of gray water included in the technologies and approaches considered. He also said he would like there to be more discussion about what is being done with solid waste throughout the Cape and to explore opportunities for connecting wastewater solutions to solid waste work going on throughout the Cape.*
    - Mr. Mark Owen from AECOM said there has been some discussion around how biosolids can be reused, such as how urine from diverting toilets can be used as fertilizer on the Cape. Some information about this is on the technology matrix.
- *A participant said the Cape needs to think about the sustainability of these technologies and approaches, such as their greenhouse gas emissions and energy use.*
    - Ms. Daly said those issues have been raised during technology panel discussions, and the technology panel has agreed that columns about sustainability concerns should be added to the technology matrix.
- *One participant asked how timescale and feasibility of these technology and approach options would be addressed. He also said that there is still confusion about the Total Maximum Daily Limit (TMDL), which needs to be addressed.*
    - Ms. Daly said that the second part of this meeting would be spent talking about the approach to applying these solutions, the time of nutrient travel and how these solutions intervene in the nutrient cycle. She also said that the controllable nitrogen discussion would be revisited.
    - *The participant responded that he thinks the group needs to define the problem before they start talking about solutions. He would like to put the discussion of the problem before talking about the solutions.*
- *One participant said she feels like she wants some sort of weighting system for the pros and cons of the technology options being considered.*
    - The technical expert responded by saying that since all watershed and neighborhoods are so different, it is not really possible to create a weighting system that will work for all. What is a deal breaker in one area may not be a deal breaker in another area. The Commission hopes that feedback from all of the Working Groups will help figure out what is most appropriate for each site.
- *A participant said that he is very happy to hear this talk about the difference between watersheds. He asked whether this site-specificity could somehow be incorporated into the information about the different technologies and approaches, since a lot of aspects about these technologies (such as their cost and effectiveness) will depend on where they are put. He feels this should be included in the materials about the technology options.*

Neighborhood level technologies/approaches

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

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 effluent. 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. (Example cases: South Burlington, VT, and West Yarmouth, MA).

Stormwater wetlands: Constructed wetlands provide aerobic chambers followed by subsurface anaerobic chambers that facilitate nitrification followed by denitrification, respectively. This process mimics the process of natural systems coupled with an engineering design that guarantees sufficient residence time within a chamber containing anaerobic conditions. (Example case: Missouri).

Participants were asked for questions and comments on these technologies:

- *One participant asked what "tertiary treatment" means and whether it can be used to treat chemicals of emerging concern?*
    - Mr. Owen said that tertiary treatment is the level above secondary treatment, and it usually involves some level of nitrogen and phosphorus removal. Removing additional nutrients and chemicals is usually more costly.
    - The participant replied that it is possible to use activated carbon to remove some of these chemicals of emerging concern.
    - Ms. Daly replied that some of the natural approaches on the technology matrix can also help address some of the chemicals of emerging concern.
- *One participant said that an issue that has come up in Falmouth is the question of where to discharge treated effluent.*
    - Mr. Owen said that the ideal discharge location is somewhere that is not an embayment. Falmouth is ringed by embayments, which makes discharge particularly challenging. Another option is to discharge a little bit into each watershed, spreading out whatever nitrogen and phosphorus is left across the nearby watersheds.
- *One participant said he is curious why STEP and STEG collection systems are being considered while other collection systems, such as vacuum collection, are not.*
    - Mr. Owen said that central collection is also considered, and that the technical committee should perhaps also consider vacuum collection systems.
    - Mr. Scott Michaud of the Cape Cod Commission said that STEP and STEG systems

limit the amount of trenching that has to be done and are an alternative to conventional wastewater collection systems.

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 nitrogen concentrations of less than 10mg/L of water.

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 the 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. (Example case: 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 inches 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. (Example case: 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. Transporting and disposing of effluent 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.

Effluent disposal—ocean outfall: Similar to out of watershed effluent disposal, ocean outfall effluent disposal involves removing highly treated effluent from watershed, but in this option, the effluent is released into the ocean. This solution is not currently permitted, and would require a high level of regulatory oversight. The solution is being considered as part of the 208 planning process due to limited land availability for disposal on Cape Cod.

- *One participant pointed out that the slide for this option should show tertiary treatment before the water goes out to the ocean.*

Phytoirrigation: In phytoirrigation, wastewater treatment facility effluent goes through secondary treatment and then is irrigated onto plants that can remove nutrients and other contaminates. Fast growing poplar and willow trees are typically used for this process. (Example case: Woodburn, OR).

Participants were asked for questions and comments on these technologies.

- *One participant mentioned since one issue is the lack of areas for effluent disposal, perhaps the Cape should consider using power line right of ways.*
    - Ms. Daly said this has been brought up by a number of people and that this should be a discussion with the utilities. She said the group could also look at road right of ways.

Neighborhood or watershed level technologies/approaches

Phytobuffers: This approach involves using trees with a deep root system, particularly willows and poplars, to capture nutrients in the soil. 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. (Example case: Kavcee, WY).

Fertigation wells: Fertigation wells can capture nutrient enriched groundwater, such as from a wastewater treatment facility discharge, and recycle it back to be used to fertilize and irrigate turf grass areas, such as golf courses, athletic fields, and lawns. Fertigation can significantly reduce nutrient loads to down-gradient surface waters while reducing fertilizer costs to the irrigated areas. (Example case: Plymouth, MA).

Permeable reactive barriers (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, thereby denitrifying the groundwater. PRB systems typically use vertical trenches, sequences of bored columns, or injection methods to introduce a carbon source into the groundwater. PRBs would be sited perpendicular to groundwater flow and aligned with roadways and power lines. Use of PRBs can remove nitrogen from water flowing through the watershed, thereby reducing the nitrogen load flowing into estuaries. (Example case: Falmouth, MA).

Inlet and culvert widening: Re-engineering and reconstruction of bridge or culvert openings to increase the tidal flux through the culvert or inlet can help reduce the nitrogen levels in coastal waters. 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 three feet of tidal range) of the Cape.

Salt marsh habitat restoration: Salt marsh, one of the most productive ecosystems in the world, surpasses rainforest in productivity per acre. Approximately 65% of historic salt marsh has been lost in Massachusetts. 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. They also support 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, thereby providing storm surge and coastal flooding protection in addition to water quality benefits in certain watersheds.

Shellfish habitat restoration: Oyster reefs were historically one of the main consumers and recyclers of nitrogen in the coastal environment on Cape Cod. However, according to the Nature Conservancy, oyster populations have declined by 95%. Restoring oyster populations may greatly reduce eutrophication in estuarine environments. It may also increase shellfish productivity, improve commercial and recreational fisheries for other species, increase protection from shoreline erosion and flooding, and provide buffering from ocean acidification. (Example case: Wellfleet, MA).

Aquaculture / shellfish farming: Farming oysters and other shellfish has 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. Oysters also remove nitrogen through their biological cycle, which puts nitrogen directly back into the atmosphere. Aquaculture can be done on man-made structures (e.g., cages or floating bags) or natural reefs.

Surface water remediation wetlands: 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 as well as their lower capital and operation and maintenance costs. (Example case: Shanghai, China).

Pond and estuary dredging: 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. (Example case: Dennis, MA).

Participants were asked for questions and comments on these technologies and approaches:

- *One participant said there are a couple approaches that aren't on this list:*
    1. *Well fences that collect and treat the plumes: collecting groundwater, treating it, and re-injecting it may be less invasive than PRB.*

2. *Injecting carbon into groundwater to uptake nitrogen is another approach. Mike McGrath is exploring this option*
    - Mr. Michaud from the Commission said that a lot of the options being explored combine a couple approaches.
    - Mr. Owen said that PRB provides a carbon source, but that people tend to only think of digging a ditch, putting in a substrate, and letting water flow through it. Another option is to remove water, treat it, and then re-inject it. Injection wells could be put in between utilities, he said.
- *Another participant said that the effectiveness of barriers varies with water levels, using Ashumet Pond as an example. Also, he said, leaching from uncapped landfills has caused anaerobic conditions in streams, which has in turn broken down some of the complex molecules.*
- *One participant said that listing the full array of what is being done on the Cape would be helpful.*
    - Ms. Daly explained that this would be covered later in the presentation.
- *The participant followed up and said that it would be good to put to put together some information for the communities that can help them work with contractors to install and use these technologies and approaches. It would be helpful to provide models that the towns can use.*
- *One participant said that it is important to keep in mind that there is a lot more detail on the technology matrix.*

Cape-wide level technologies/approaches

Compact development: 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 also providing a common disposal area. Compact development is also referred to as “Smart Growth.”

Fertilizer management: Managing fertilizer application rates to lawns, golf courses, athletic facilities and cranberry bogs can reduce nutrient input into the watershed. Residential lawn loading rates could be reduced on existing developed parcels through an intensive public education and 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), 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.

- 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. More information about this on the Commission website.

Remediation of existing development: Existing developments or schools with excess wastewater treatment capacity can 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. This is a good private-public partnership.

Transfer of development rights (TDR): Transfer of development rights is a regulatory strategy that transfers development rights from one property (known as the sending area) to another property (known as the receiving area). This strategy is used to direct growth and associated nutrient loading away from sensitive receiving watersheds or water bodies. When development rights are sold, the protected parcels receive a deed restriction that limits future development on these properties. The deed restriction can limit the number of homes or tie development to the availability to future wastewater treatment facility infrastructure.

Stormwater best management practices (BMP): There are a number of non-structural best management practices stormwater strategies that can be used to reduce nutrient runoff, including: street sweeping, maintenance of stormwater utilities, education and public outreach programs, land use planning, and impervious cover reduction and control. Many towns map existing stormwater utilities. The Commission will try to add those data to the 208 Plan Reference Map.

Participants were asked for questions and comments about these technologies.

- *One participant asked whether anyone knows how much fertilizer contributes to the nutrient load in the watershed and how much could be removed through proper fertilizer management —he wants information for the Mashpee Health Board.*
    - Ms. Daly said that, assuming a 50% reduction, which the Commission thinks is realistic for good management based upon its recent study, this could have significant impacts. In some areas, it could even prevent the need for sewering or other major technologies.
- *Another participant said many things can be done to raise the public's awareness of fertilizer problems. For example, it is possible to sell slow-release fertilizer in stores. This may be an advertising problem and there is potential, long term, of getting the*

message across. He doesn't feel fertilizer management will result effectively by regulation but rather through education and engagement.
    - Ms. Daly replied that she sees this as an opportunity to have a widespread effect. She also mentioned that the golf courses are doing a great job of reducing and managing fertilizer use.
- *One participant said he thinks people undervalue the role of public education and engagement. He said he recently attended a workshop where he learned that if people properly maintained their septic systems, this could remove more emerging chemical contaminants than a standard wastewater system. Since this work will need to be done by individuals, he feels that education is key.*
- *One participant said that the turf industry should have information on how much nitrogen is really necessary for fertilizing.*
    - He wasn't sure this would be public information. He said he would look into it.

Town Consideration of Alternative Technologies and Approaches

Ms. Daly gave an overview of some of the alternative technologies and approaches Cape towns are currently considering or have in place. These include:

- 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 System.

Ms. Daly asked participants for any general questions or comments about technologies and approaches.

- *One participant asked where wood chips are placed in the subsurface nitrogen removal septic systems?*
    - Mr. Michaud said he thinks they are below the septic system, but he will confirm this.
- *A participant asked: "What is the relationship between TMDLs, future build out, control technologies, and funding?"*
    - Ms. Daly responded that the scenarios to be discussed in the next meeting will focus mostly on existing development, but that the Cape will have to think about future development.
- *One participant asked about funding.*
    - Ms. Daly encouraged stakeholders to go to the Commission website and look at the Funding workshop the Commission convened.

    - She said there are a whole series of financing approaches that are being considered by the financing advisory committee, and that the Commission knows that the bottom line is that it has to be affordable or people won't do it.
- *A participant asked for more information about the stormwater management effort at in the Little Pond Watershed in Falmouth*.
    - Another participant explained that the group is measuring stormwater in the area, identifying problem sites, and trying to address these concerns as much as money allows.
- *One participant encouraged the Commission to think about dealing with the entire water cycle, saying people tend to focus on the wastewater side of things. He said people need to think about evapotransporation and filtration, and that these processes will be affected by climate change and other environmental changes. Hence, he added, the planning effort should take these environmental changes into account.*

Survey Monkey Results

Ms. Daly quickly reviewed some of the key findings from the survey monkey poll and thanked participants for contributing to this.

After a short break the meeting resume

IV. PROBLEM SOLVING PROCESS AND PRINCIPLES

Review of TMDLs and nitrogen targets

Ms. Daly began the discussion of the problem solving process and principles with a review of TMDLs and nitrogen. She explained that the Working Groups will focus on total controllable nitrogen load. The technologies and approaches selected should aim to reduce the total controllable nitrogen load by identifying options that reduce the portion of septic load that needs to be reduced. For example, the portion of septic load that needs to be reduced could be made smaller if Cape Cod takes on fertilizer and stormwater solutions first. Additionally, the percentages of controllable nitrogen that need to be removed to meet TMDLs change depending on the characteristics of the watershed.

- *One participant pointed out that the numbers on slides are from 2001, so the actual numbers of what needs to be removed are probably too low.*
    - He expressed concern about using percentages for removal targets for this reason, since the baseline is changing.
- *Another participant asked what it means ecologically if the TMDL is achieved. He asked whether the target load is designed to allow for remediation of compromised ecosystems and to restore them to the state they were in before degradation. He also asked how long it would take to restore these ecosystems.*
    - Mr. Michaud said the TMDL is designed to sustain a healthy ecosystem and to return

the ecosystem back to a healthy state, but how long it takes to restore the system isn't known.
    - Another participant said that we don't scientifically know how much we can restore the system or how long it will take.
    - Another participant said the path to recovery isn't the inverse of the path to degradation. She added that simply reducing the nutrient loads to the level they were at when the region still had eelgrass wouldn't mean there would suddenly be eelgrass again.

Overview of 7-steps for Problem-Solving Process

Ms. Daley reiterated that the ultimate goal the Working Groups is to develop remediation options that would achieve water quality targets 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). She then described the alternatives screening process the group will apply. The process is as follows:

1) Targets/Reduction Goals: Establish targets and reduction goals; articulate project goals.
2) Other Wastewater Management Needs: Identify priority geographic areas (e.g., high nitrogen reduction areas, Title V problem areas, pond recharge areas).
3) Low Barriers to Implementation: 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) Watershed/Embayment Options: Assess alternative options to implement at the watershed or embayment scale (e.g., innovative and lower-cost solutions)
5) Alternative On-Site Options: Assess options to implement at the site-level
6) Priority Collection/High Density Areas: Examine priority/high density areas for wastewater collection
7) Supplemental Sewer: Consider traditional sewering or other grey infrastructure management options

Ms. Daly noted that through mixing and matching technologies and addressing key issues, such as fertilizer in certain areas, it might be possible to totally avoid sewering in certain areas.

Technology Selection: Process and Principles

Ms. Daley noted that the Working Group had identified many 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 that 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.

General Questions and Comments

Participants were asked for general questions and comments about the problem-solving process and principles.

- *One participant mentioned that plumes rise to the surface when close to ponds and wetlands and that, therefore, biosolutions around these areas can be more effective.*
    - Mr. Michaud replied that this point brings up the important fact that natural systems already do a good job of removing these nutrients.
    - Mr. Owen agreed and said that enhanced treatment within streams entering estuaries, may be able to enhance the positive effect.
- *Talking about the Embayment TMDL Map, one participant said she "can see the mental block around TMDLs." She asked whether the Department of Environmental Protection (DEP) needs empirical evidence that areas have met their TMDL goals or whether modeled evidence is sufficient.*
    - A participant who is knowledgeable about the DEP process said that communities will put forward their comprehensive wastewater plans, which should include stormwater management. In their plans, they will indicate what they think are their best options for removing nitrogen, and will ask DEP "what money are you going to give us to make progress toward doing these things?" DEP may issue them credits toward removal. Then, towns and communities are going to have to monitor ponds and water bodies. The participant said that communities will have to monitor not just treatment areas but also around sentinel stations to make sure that water quality objectives are being met. They will also want to monitor the interventions they have put in place (such as oyster reefs or PRBs) to see what effect these approaches are having on nutrient loads. He said this is going to have to be adaptive management, there is going to have to be some experimentation and learning as we go. He said this will need to be a partnership between DEP and towns to see what works and what doesn't.
    - One participant replied that the TMDL obligation is to meet applicable water

quality standards; if you remove all of the nutrients you commit to removing but still don't hit target, you have to do more. Towns and cities aren't removed from the list until they comply with water quality standards. They are given the flexibility to try lots of things and take time to achieve goals, but they still have to hit water quality targets.

- One participant said that towns are anxious about TMDLs but that they might be less so if they fully understood how this process works.

- *A participant pointed out that having sufficient time to monitor before implementation in order to provide a sound baseline is challenging. Having a good baseline can help sort out the effect of interventions from natural fluctuations. He said that monitoring needs to begin now to build up this baseline data.*
    - Another participant said that monitoring has been underway in Waquoit Bay and Poppenesset Bay for about 17 years, since the mid-1990s.

Mr. Thompson, the facilitator, asked whether this proposed 7-Step Problem Solving Process makes sense and what the participants think about it.

- *One participant said he has doubts about the things that are listed as having low barriers to implementation. He said that, while these options may not cost a lot, it may be challenging to ensure their implementation. Effectively implementing voluntary efforts, he said, is not "low barrier"—it is really challenge.*
- *Another participant said that she thinks the 7-step concept makes sense, but is concerned about managing public expectations. She fears that some might use this diagram to say "we're going to save costs by doing all of these things" only to come back in 10 years and say "it's not working", leading to frustration. She's concerned that those desperate for a low cost solution will therefore grab onto these low cost alternative solutions and assume they will solve the nutrient-loading problem. Her worry is that this might lead to problems down the road and not adequately address the nutrient problem.*
    - Another participant added to this point and said that the Cape is going to continue to grow and that unless we get to the growth part of this—managing future growth—we may just have future problems
    - Mr. Owen explained that if a PRB was put in place with the expectation that it would reduce something like 1000 pounds of nitrogen, it would be monitored over a time period and the actual reduction might be higher or lower than the expectation, but it would almost certainly not be zero. Doing these kinds of demonstration projects on the Cape would give everyone a better idea of how effective these interventions actually are. Then, going forward, everyone would have a better idea of what particular technologies cost and how effective they are at removing nutrients. He said that, with treatment plants as well as alternative technologies, it is still necessary to do a lot of monitoring.
    - A participant replied to the above discussion that, in light of the cost of interventions, no one is going to overshoot and try to reduce more than they have to. Therefore, if interventions perform less well than anticipated, towns

and cities are going to fall short of their TMDL goals.

- *Another participant said that he doesn't like the 7-step problem solving process. He is concerned that it will be used to stall action and may be used as a reason for towns and cities to put off what actually needs to be done to deal with the problems. He suggested that the Working Group might need to prioritize what areas and things in terms of greater and lesser urgency and importance.*
- *A participant also said that leadership is needed. He said if we are going to turn Cape Cod into an experiment, there needs be progress on the issue at the same time. He feels that leadership requires being firm about what needs to be done today to reach TMDLs. He also feels that taking leadership on the issue means putting in place regulations on future development to prevent the issue from getting worse.*
    - Mr. Thompson asked for clarification on this point, asking whether the participant is concerned that the 7-step process will be misused or whether he thinks that it is just not helpful.
    - The participant explained he thinks it will be misused, since people tend to have a "follow the money" mentality. He said that people who own summer homes and aren't year-round residents won't want to pay for interventions. The alternative technology experiments are going to take at least 5 to 10 years before we know how well they're working, he thinks, and he is concerned about where the Cape will be at by then in terms of water quality and wastewater issues.
    - A number of other participants agreed with this concern.
    - One participant added that in town after town, plans to sewer haven't been acted on. He is concerned that this is going to happen in Falmouth next spring. He said that 5 to 10 years ago, the Commission was saying "let's sewer," and now it's saying something different because sewering hasn't been implemented. He asked, " How do you get around this?"
    - Ms. Daly clarified that the Commission knows that sewering is going to be necessary in some watersheds, and that it will make public statements to this effect.
- *Another participant said that water clarity is an easy way to evaluate water quality. He likes the 7-step approach put forward by the commission. He thinks that people can figure out pretty quickly whether approaches are working, and then the goal is to move through the steps to keep implementing solutions until you meet water quality goals.*
    - Mr. Owen clarified that some of the monitoring that will take place will require 5 or more years to know whether or not an intervention removes a certain amount of nitrogen. However, with other interventions, it will be easy to detect whether it is having a beneficial effect. And some of these other interventions could result in impacts a lot more quickly than sewering, which can take years to have an effect due to nutrient travel time. Also, he reminded the group, towns may not pass sewering, in which case, nothing happens.
- *Another participant said that we already know where we're going to need sewering regardless. She suggested that the Cape should target those obvious areas for*

sewering. She said that if the selectmen decided "we have to do this" and they worked with finance people to figure out how to present it, then it likely would pass and would get implemented. Simultaneously, she said, we can be putting in place interventions that will have more immediate effects. Therefore, she thinks the problem solving approach will require parallel tracks of intervention.

  - Another participant followed up on this point and said that his problem with the 7-step approach is that it is numbered 1 to 7 as a sequential process, rather than indicating these activities may be simultaneous.
  - Ms. Daly clarified that the Commission is looking at both conventional and alternative approaches at the same time.
  - A participant said the diagram should convey that certain areas need to go directly to sewer, whereas other areas should move through these steps.

- *One participant explained that the DEP is going to review local comprehensive plans. The DEP will push back on towns and cities if they don't think their plans are sufficient to address the problem.*
- Mr. Owen said he sees this 7-step approach as a planning framework to help towns and cities think through how they can deal with the problem. He thinks going through the 7-step planning process should take only about 3 months.
- *One participant said she feels addressing this issue and the associated cost has to be shared across the Cape. She said this may not be "politically correct," but necessary nonetheless. Also, she thinks the problem isn't just about wastewater, but that it is also about drinking water and swimming areas.*
  - Some participants agreed that cost-sharing is important.
  - They also think that focusing more on drinking water and not just on the nutrients that are being put into the watershed would be helpful.
  - One participant suggested that is important to find a way to get people who are coming over the bridge and using facilities on the Cape to pay into the solution.
- *A participant pointed out that environmental justice issues are a concern, citing unequal ability to pay and suggesting that some form of graduated payment scheme might be necessary.*
- *One participant commented that he feels the burden for paying for addressing the water quality problem has to be put on the property tax base. He thinks this best reflects people's ability to pay. He doesn't feel interventions should be paid for through betterments, since this doesn't distribute the cost.*
- *Another participant said that public private partnerships, TDRs, and other similar approaches can innovatively deal with the issue. He also said that if towns do a lot of this work locally, it will create jobs and direct and indirect economic benefits. He said people should think about balancing costs versus the benefits of creating jobs and keeping work locally. There are ways to reduce the impact on local people and prevent this from all being a drag on local taxpayers.*
- *A participant said that ecotoilets can be used to capture and reuse resources such as nitrogen and phosphorus, and that the Cape could take advantage of this. He is*

skeptical that stormwater and fertilizer management are going to be as effective in reducing nutrient loads as the Commission thinks. However, he likes this framework and thinks it is helpful.

- *One participant commented that the states and federal government are looking at issues associated with climate change, particularly in areas that are vulnerable to sea level rise. He thinks the group should add climate change as a consideration for all technologies and approaches. He also said that states have started to buy out vulnerable coastal areas in certain regions. The Environmental Protection Agency (EPA) is spending quite a bit of its resources on these kinds of issues, he said. He thinks climate change impacts and vulnerability will be considered by DEP when they review comprehensive plans.*
    - A participant replied to this that oyster beds may not be able to survive ocean acidification, and that this could be a problem if they are being used to mitigate nitrogen.
    - Another participant pointed out that there could be some co-benefits between resilience-building efforts, such as oyster reefs to protect from storms, and wastewater remediation.
- *A participant suggested that crossing town lines has been an ongoing issue, and that there needs to be better communication between towns. She suggested and MOU that could be easily implemented.*

Following questions and comments, Mr. Thompson provided an overview of some of the key considerations and concepts brought up throughout the meeting. The points he captured were:

- Think about and try to emphasize co-benefits of certain approaches, such as the possibility of increasing resilience to climate change while mitigating nutrient loads.
- Focus on getting the most out of approaches and technologies. For example, PRBs may be most effective where plumes come to the surface.
- Enforceability can be challenging and needs to be considered.
- Expectation management is important. We need to convey that doing the easiest things along is unlikely to achieve targets, while also conveying that there are many approaches towns and cities can take to address the problem.
- Leadership is necessary. This can help with identifying priorities and addressing funding concerns.
- People are reluctant to put funds into something that isn't highly visible. It is important to make a compelling case to people who have to support interventions.
- There is a tension between experimentation and implementation of techniques we know will be effective.
- How long will it take to see measurable results? We need to keep this in mind.
- Who bears the cost? We need to think about cost-sharing, as well as Environmental Justice and ability to pay concerns.

V. PLANNING FOR THE NEXT MEETING

Mr. Thompson reminded participants that the next and third meeting will be held:
Wednesday, December 11, 2013; 1:00PM – 5:00PM
Mashpee Town Hall, 16 Great Neck Road North, Mashpee

Ms. Daly said that during the third meeting, Working Groups will examine various scenarios (i.e., combinations of solutions) and potential impacts (e.g., nutrient reduction, economic impacts, environmental impacts, social impacts, etc.) of each. During the meeting, the Cape Cod Commission will use analytic tools to calculate the impact of particular ideas and options. 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.

Ms. Daly encouraged participants to attend the November 13th meeting for all stakeholders from all 11 working groups. This meeting will be an opportunity to talk about how the Commission can engage stakeholders in continued efforts during the January to June timeframe. The meeting will be held at 6:00pm in the Cape Cod Museum of Art, Dennis, MA.

APPENDIX ONE: MEETING PARTICIPANTS

Name	Affiliation
Working Group Members	
Tom Fudala	Mashpee Planning, Sewer & Water District
Andrew Gottlieb	CCWPC
Jessica Rapp Grassetti	Town of Barnstable, Town Councilor
Peter Hargraves	FACES
Alison Leschen	WBNERR
Win Munro	Wastewater Committee, Falmouth
Dale Saad	Barnstable DPW
Art Traczyk	Town of Barnstable
Public	
David Dow	Sierra Club
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