Cape Cod 208 Area Water Quality Planning
Provincetown Harbor Watershed Working Group
Provincetown Town Hall
Second Meeting

260 Commercial St, Provincetown, MA 02657
October 31, 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

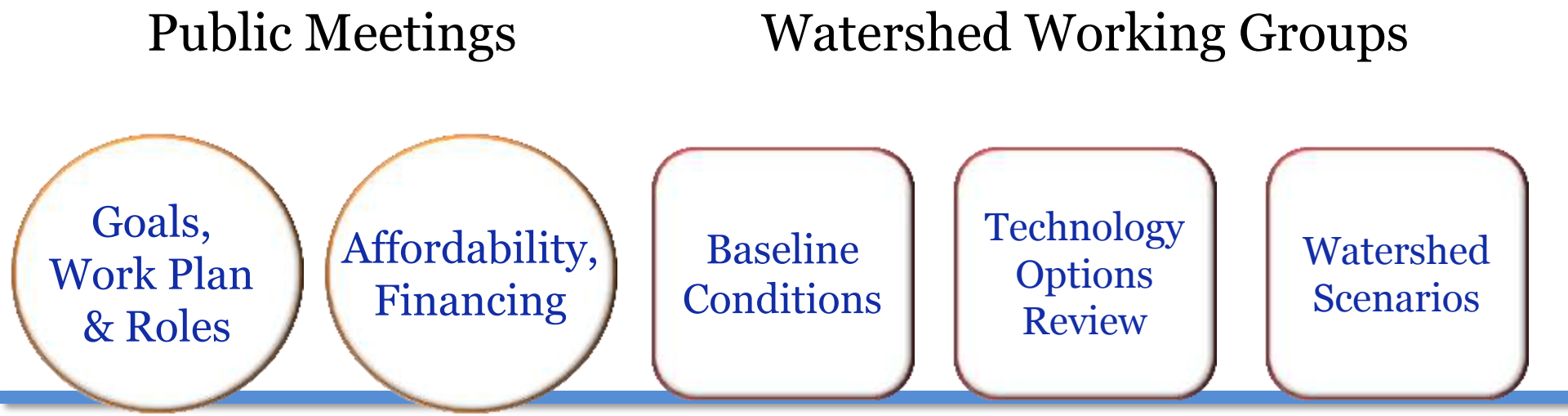
12:15 Public Comments

12:30 Adjourn

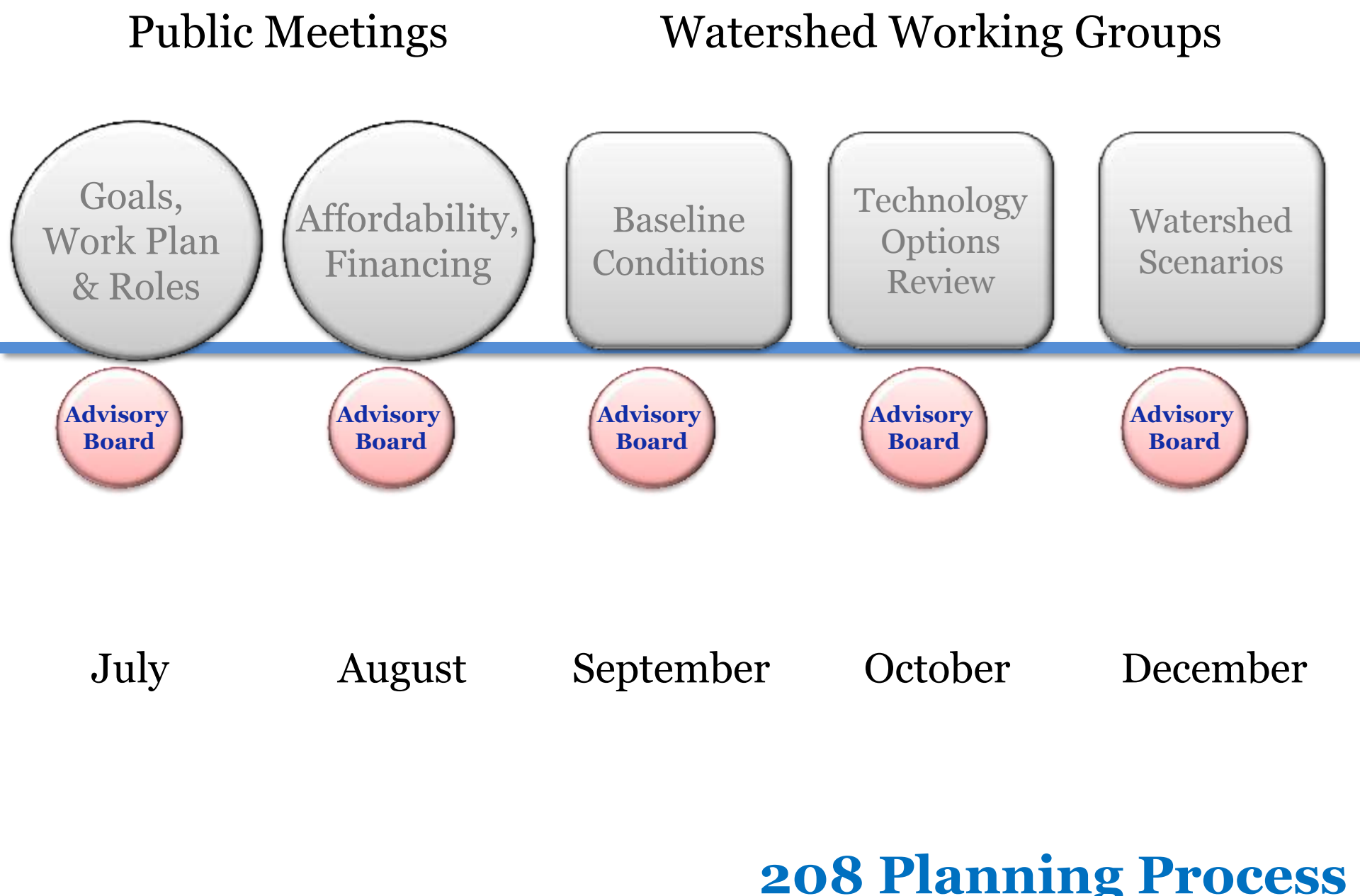
Provincetown Harbor Group

Technologies and Approaches

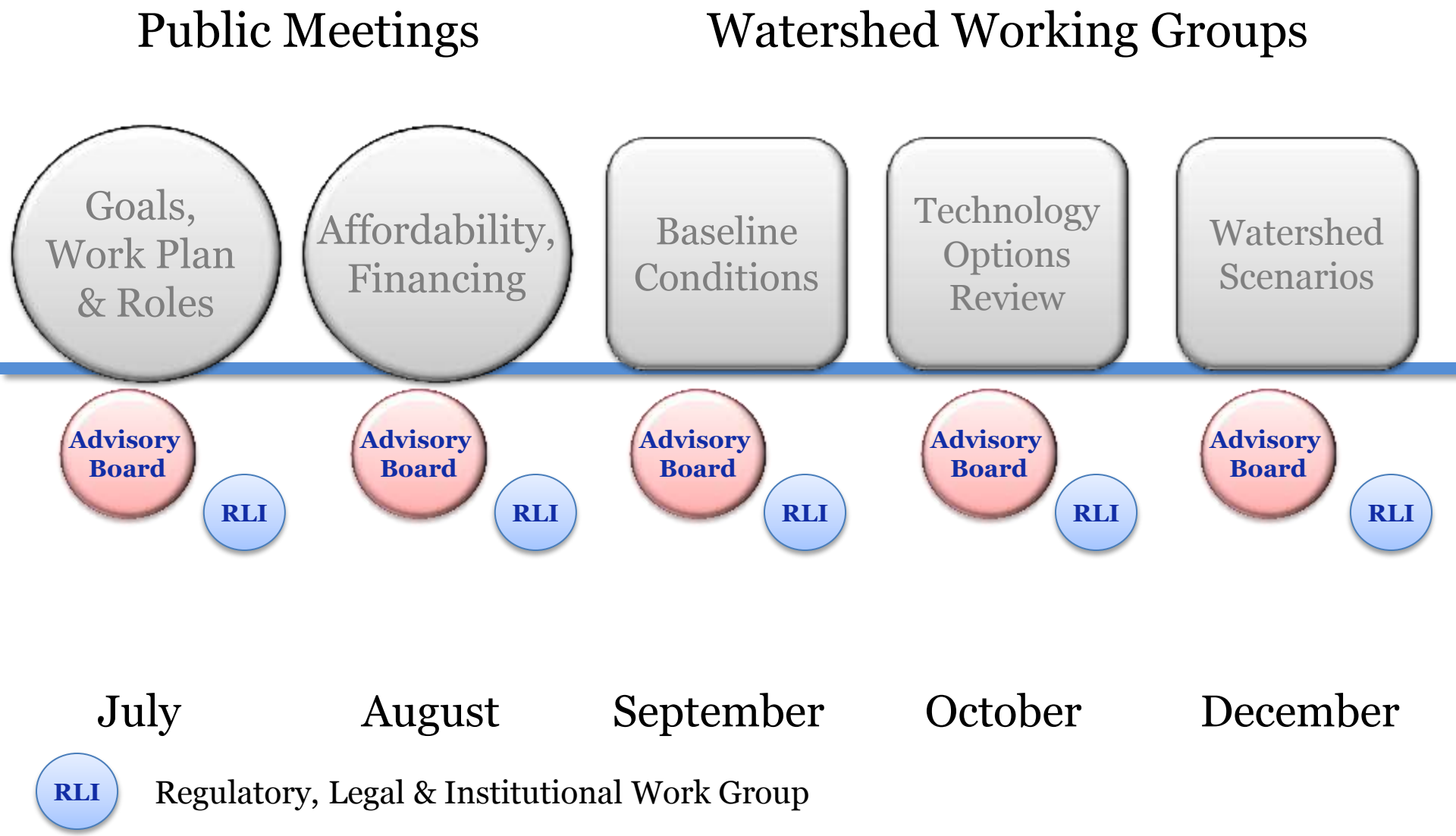
What is the stakeholder process?



208 Planning Process



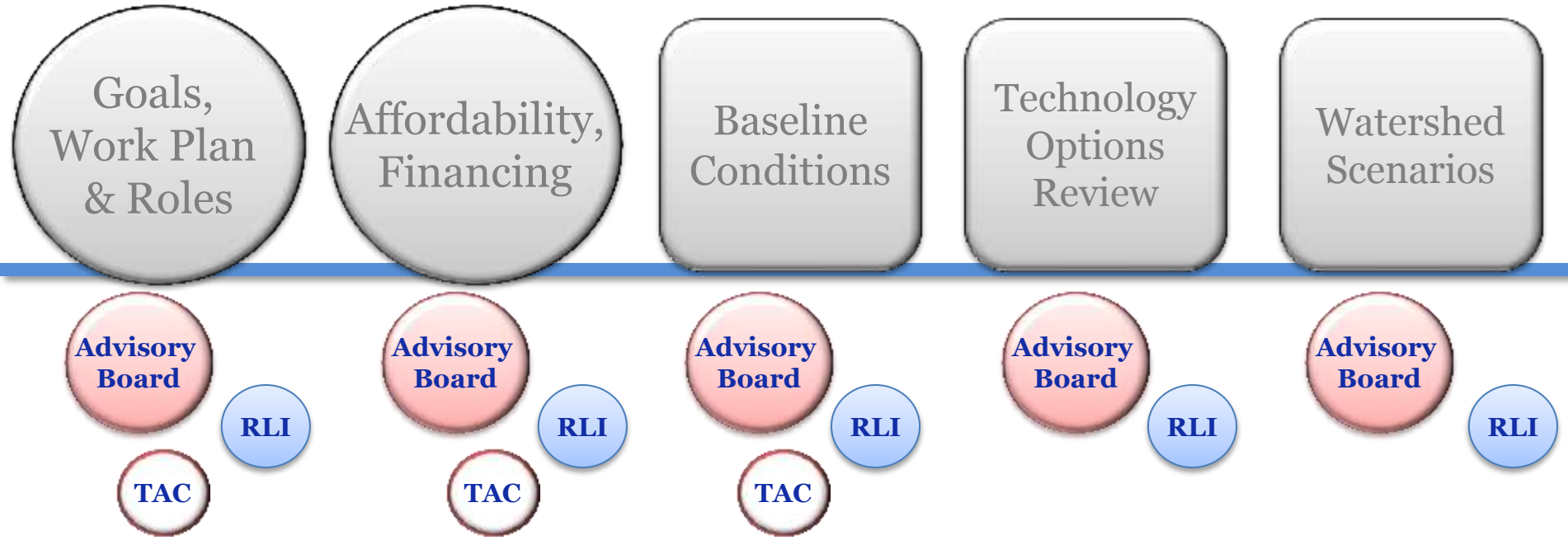
208 Planning Process



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

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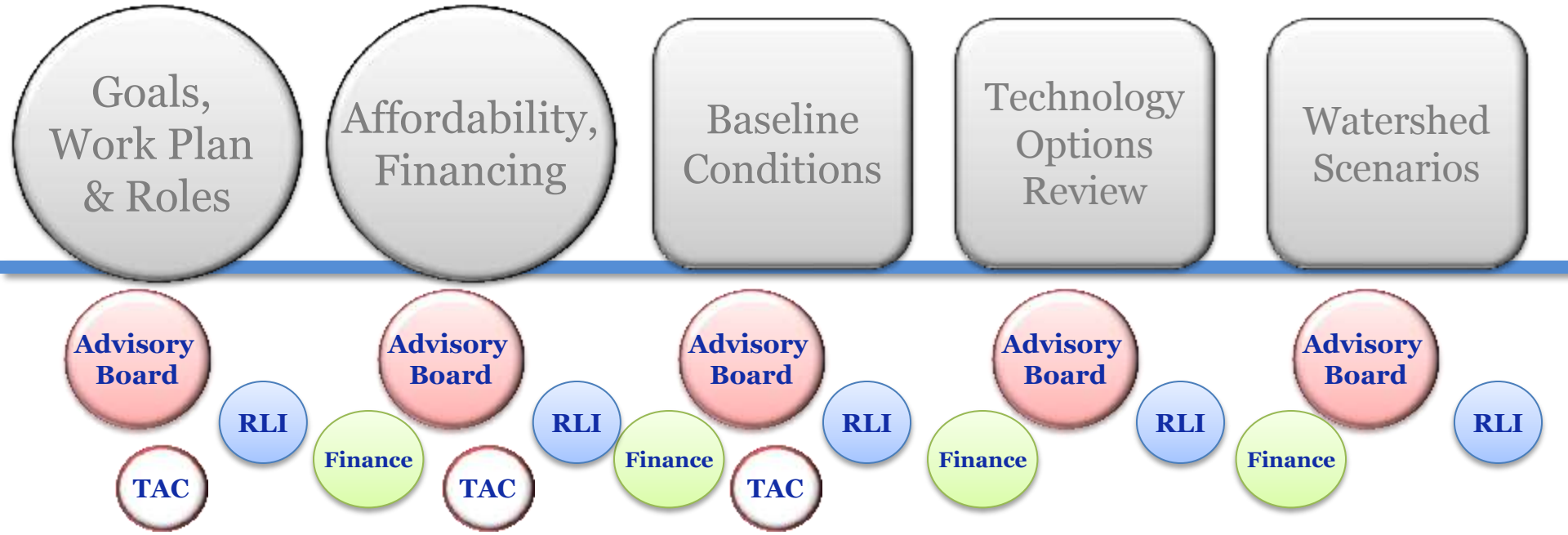
Watershed Working Groups



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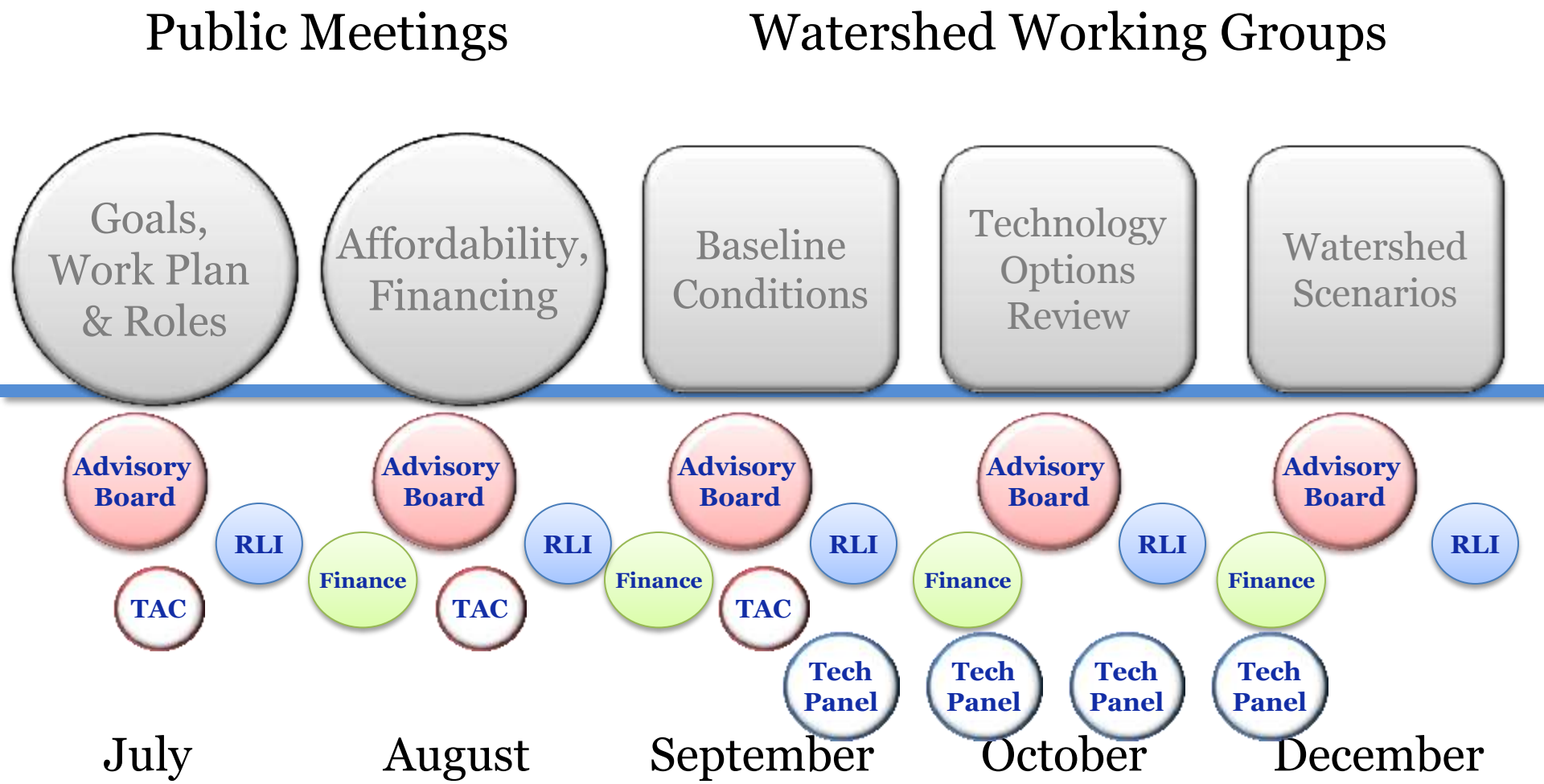


RLI — Regulatory, Legal & Institutional Work Group

TAC — Technical Advisory Committee of Cape Cod Water Protection Collaborative

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

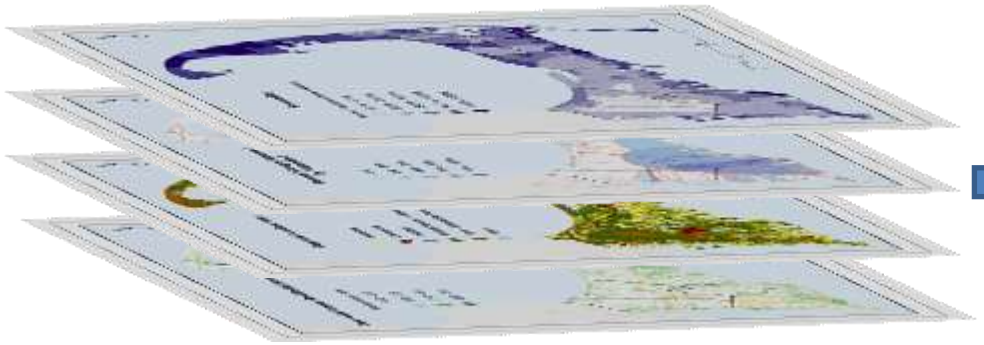
11 Working Group Meetings: Sept 18-27

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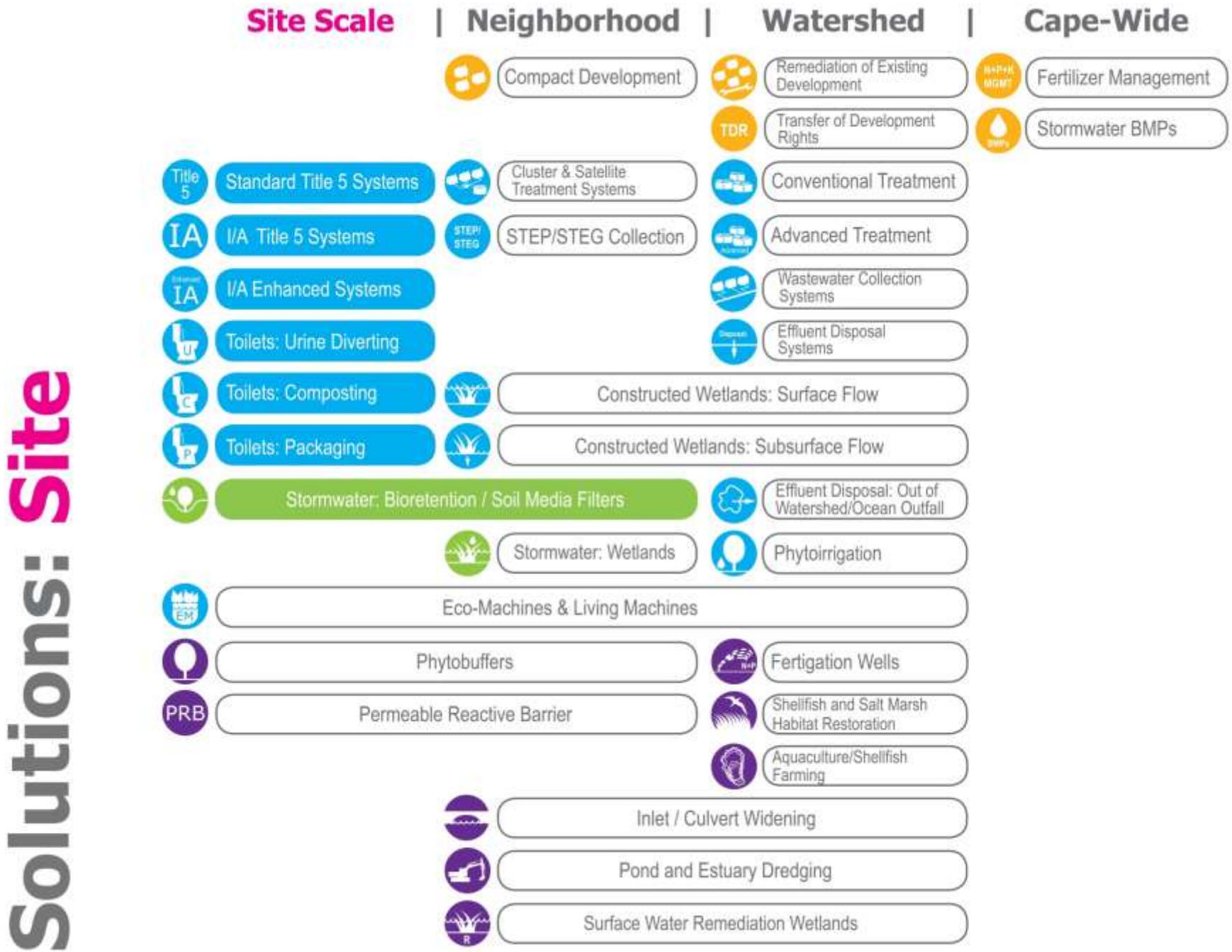
- Regulatory programs can address nutrient controls for both existing development and future development.


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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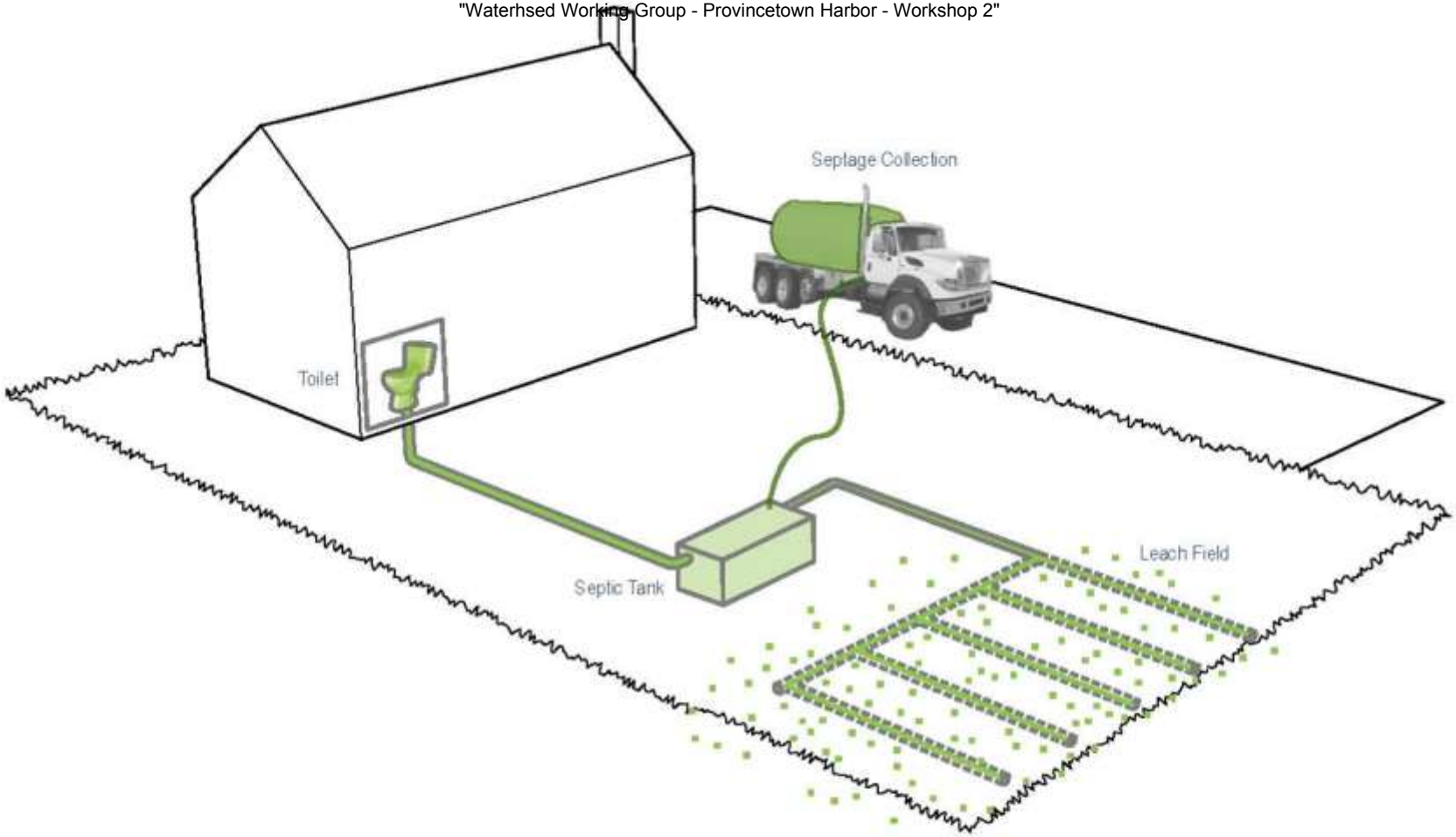
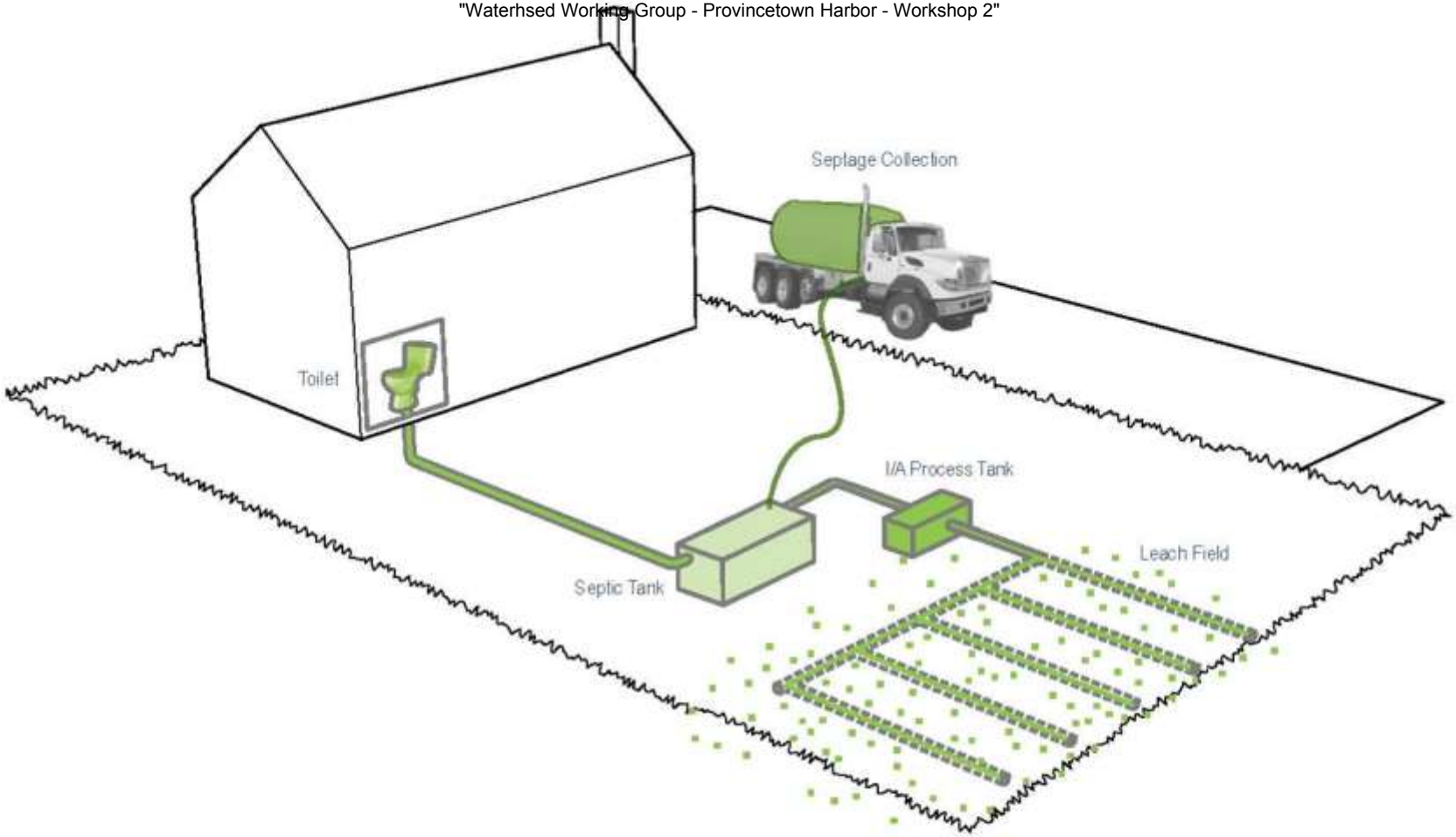


Scale: SITE
Target: WASTEWATER

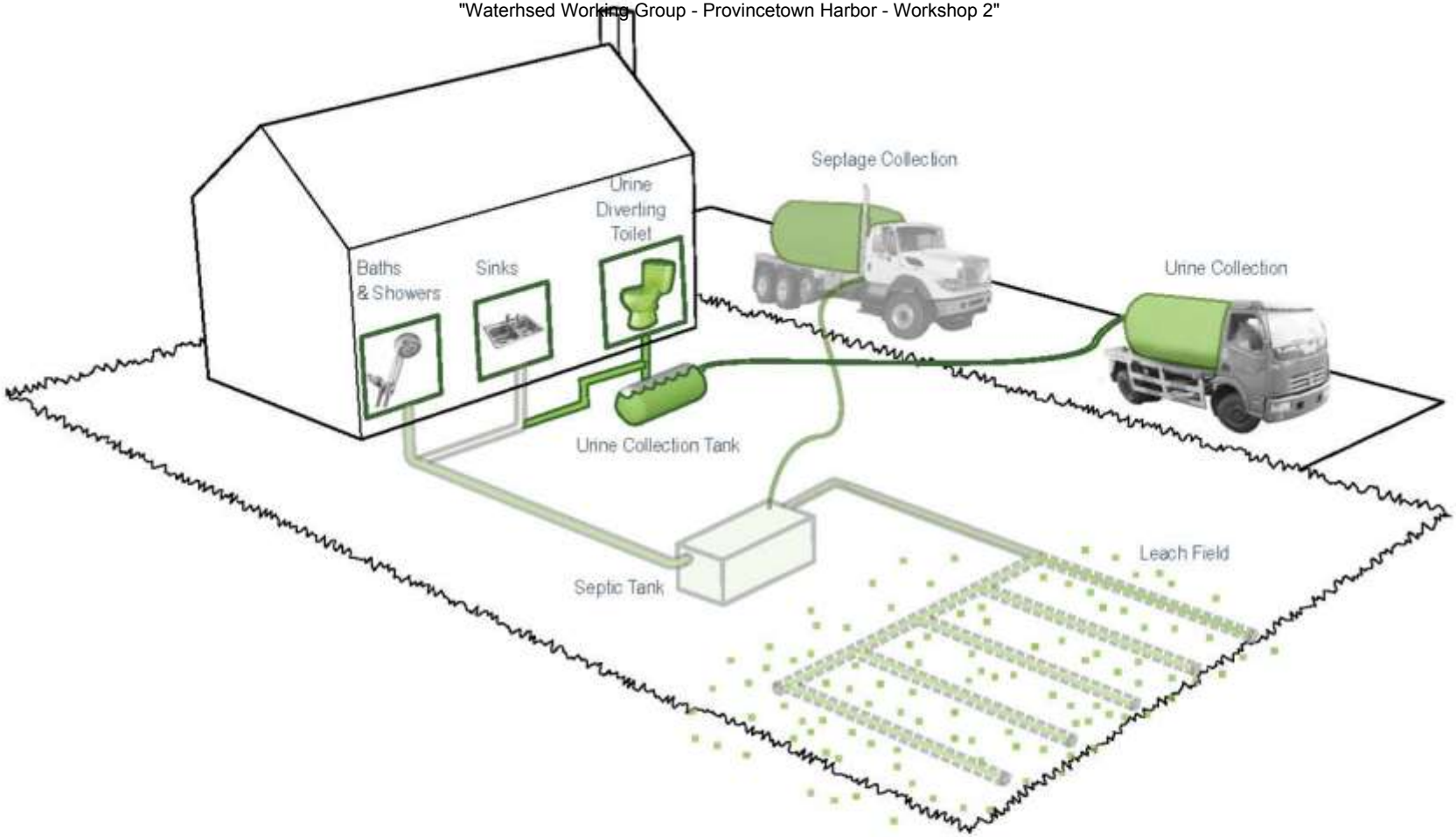
Standard Title 5 Systems

Title 5



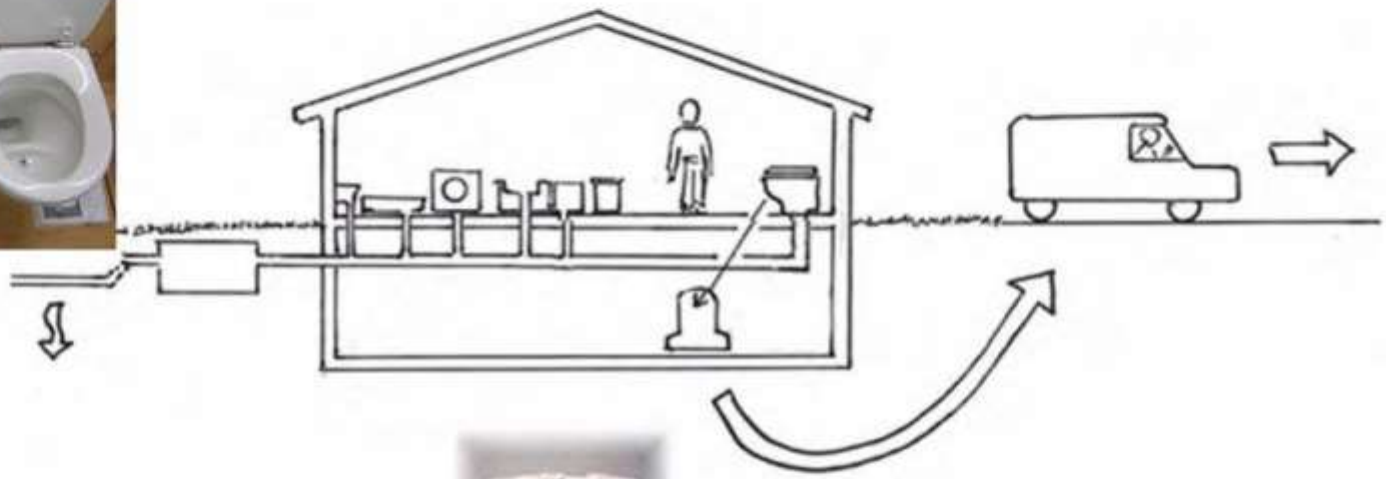
Scale: SITE
Target: WASTEWATER

I/A Title 5 Systems



Scale: SITE
Target: WASTEWATER

Toilets: Urine Diverting



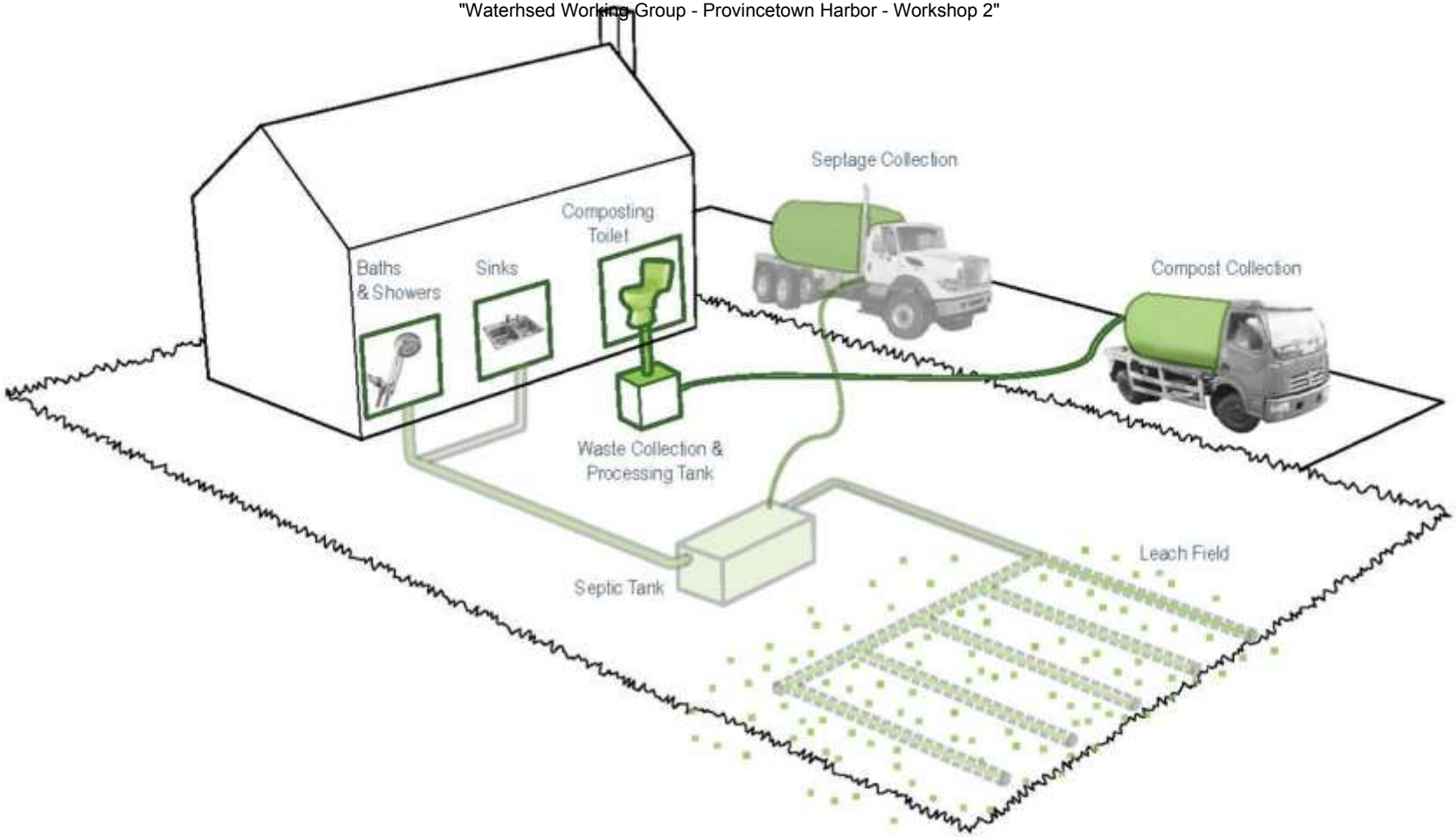
Waterless
Urinal

IBC container
(220 gallons)

40" x 40" x48"

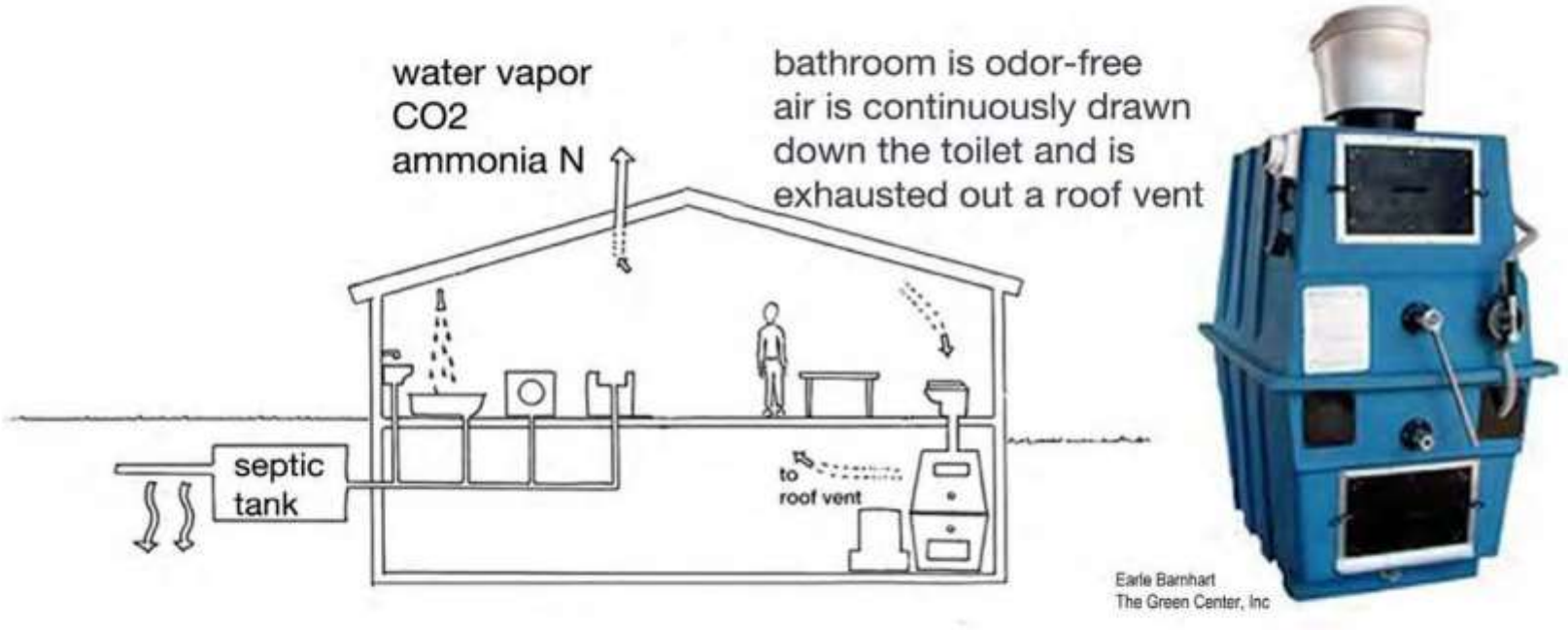
Source: Earle Barnhart, The Green Center Inc. and Horsley-Witten Group Inc.

Toilets: Urine Diverting



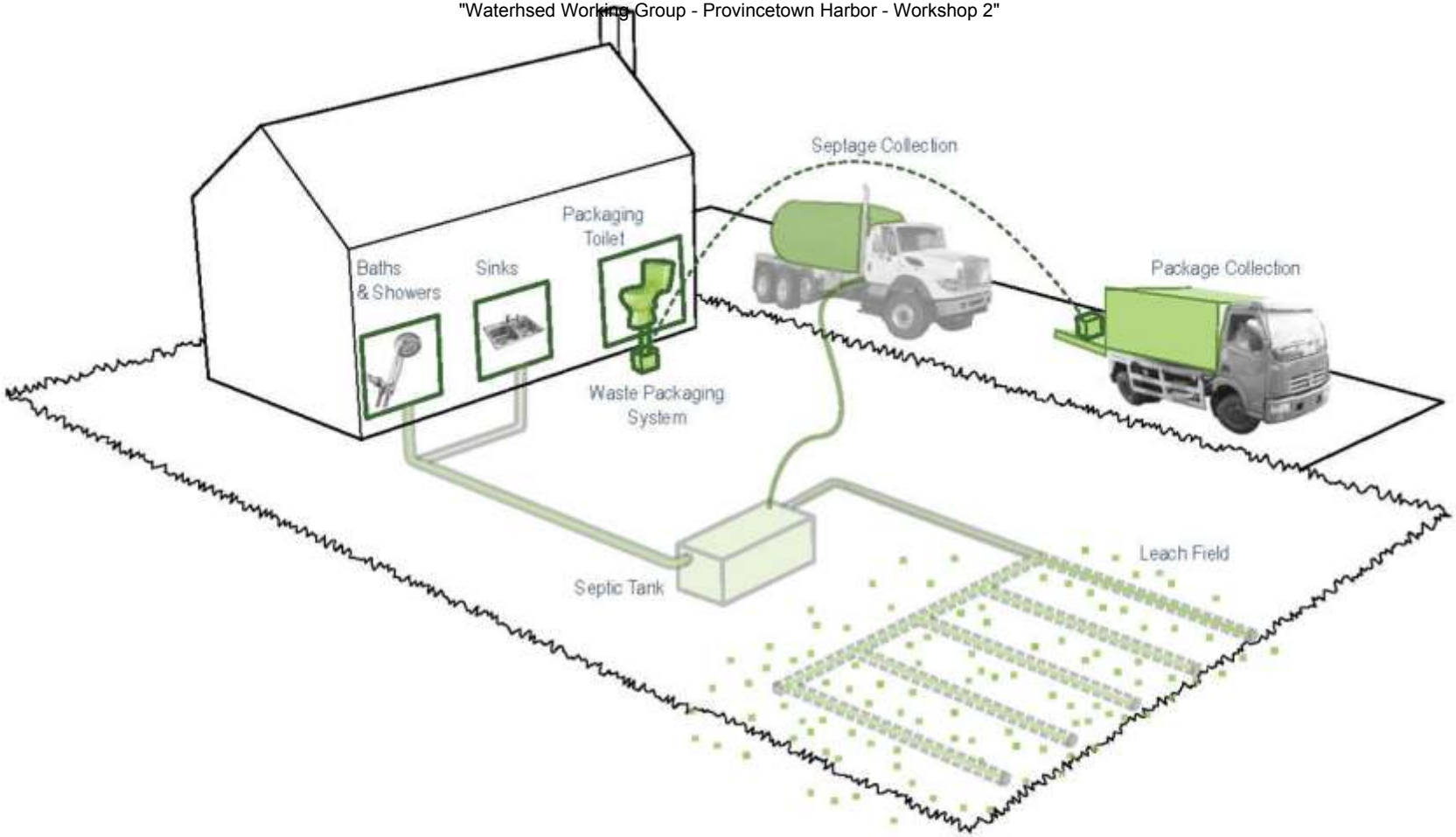
Scale: SITE
Target: WASTEWATER

Toilets: Composting



Source: Earle Barnhart, The Green Center Inc.

Toilets: Composting

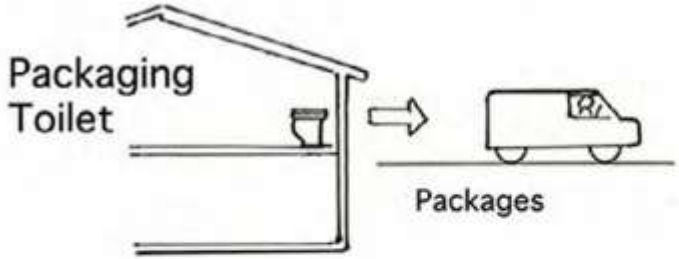


Scale: SITE
Target: WASTEWATER

Toilets: Packaging

PACTO®

LOOWATT



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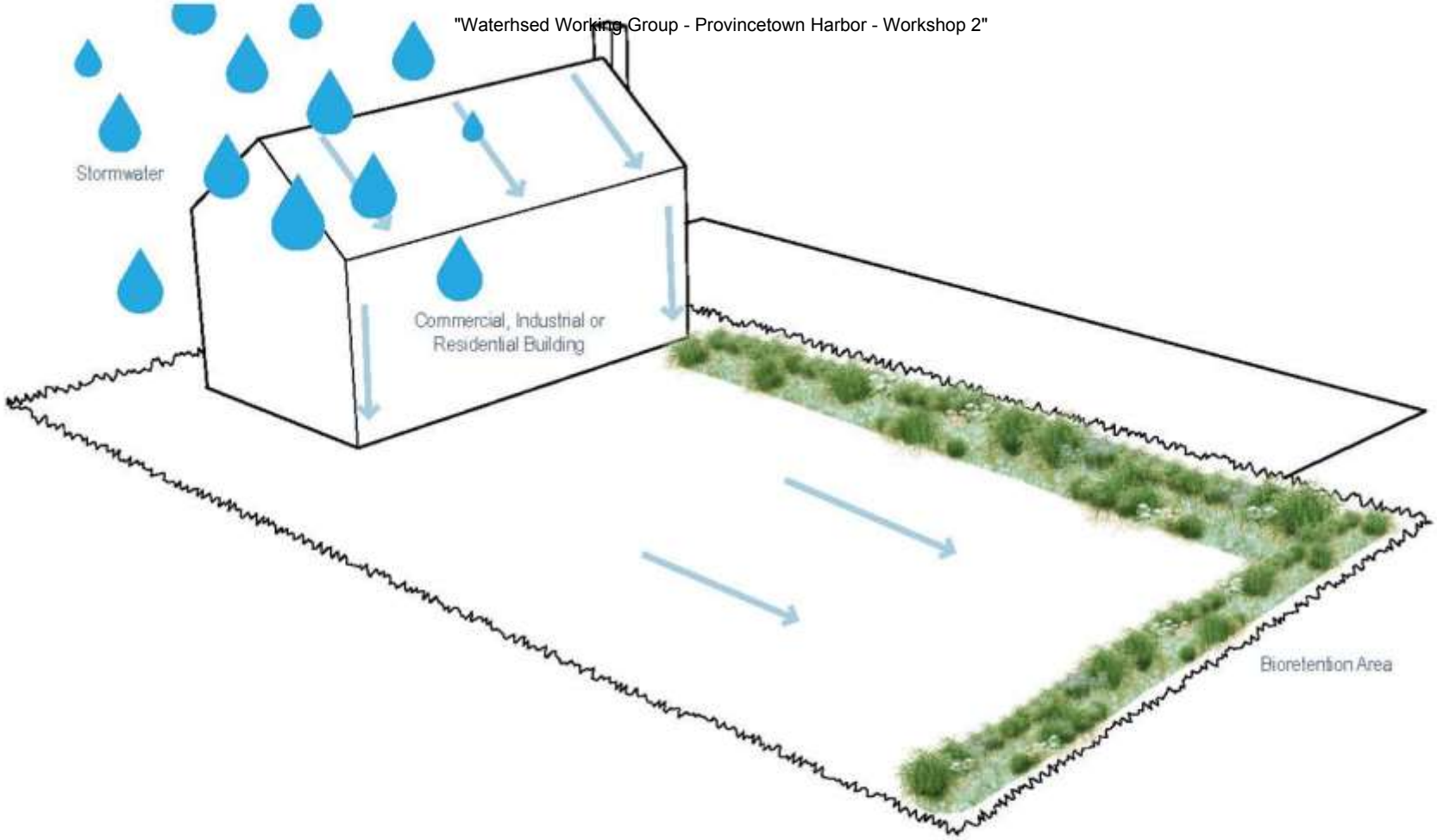
Toilets: Packaging



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


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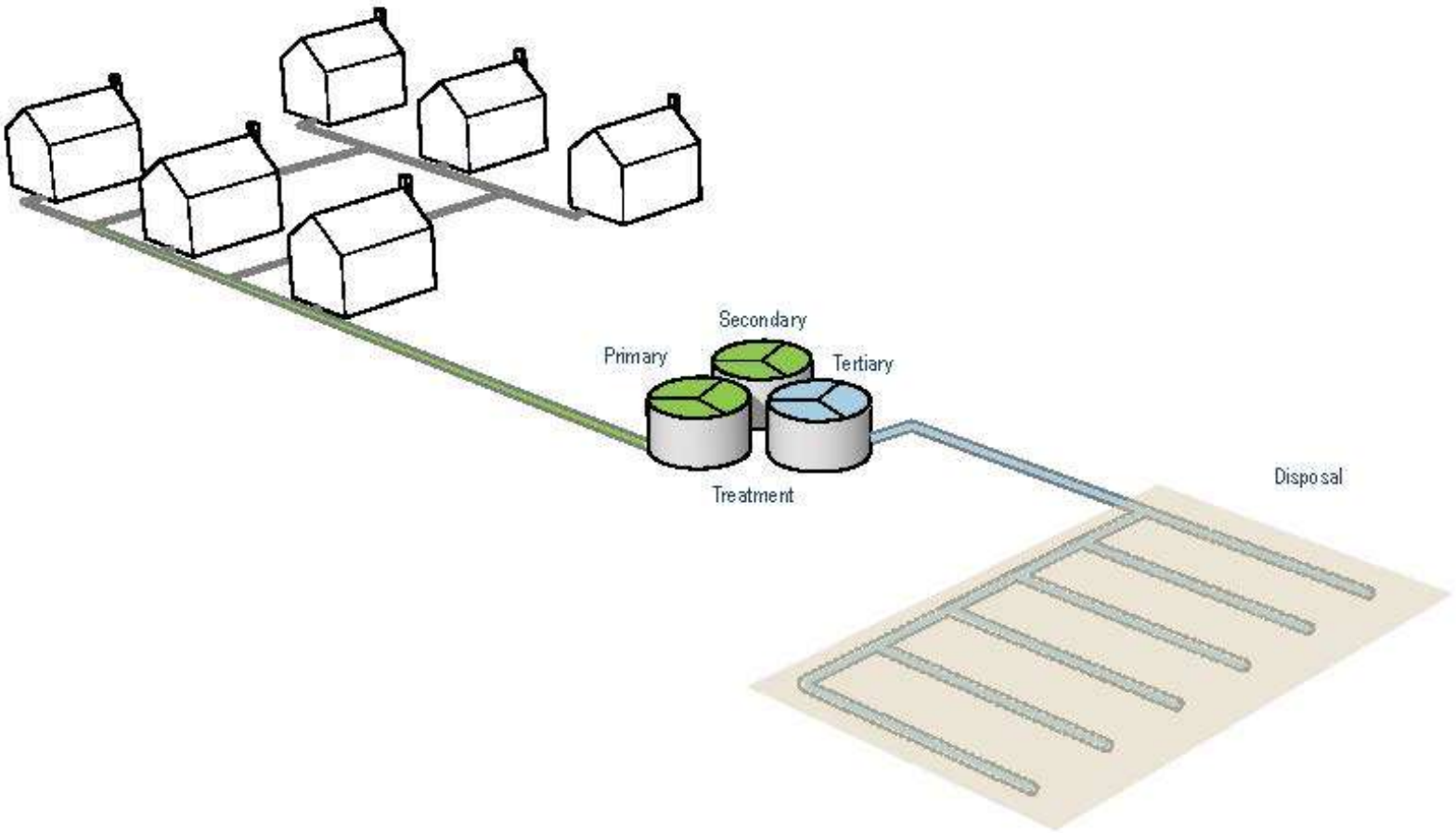
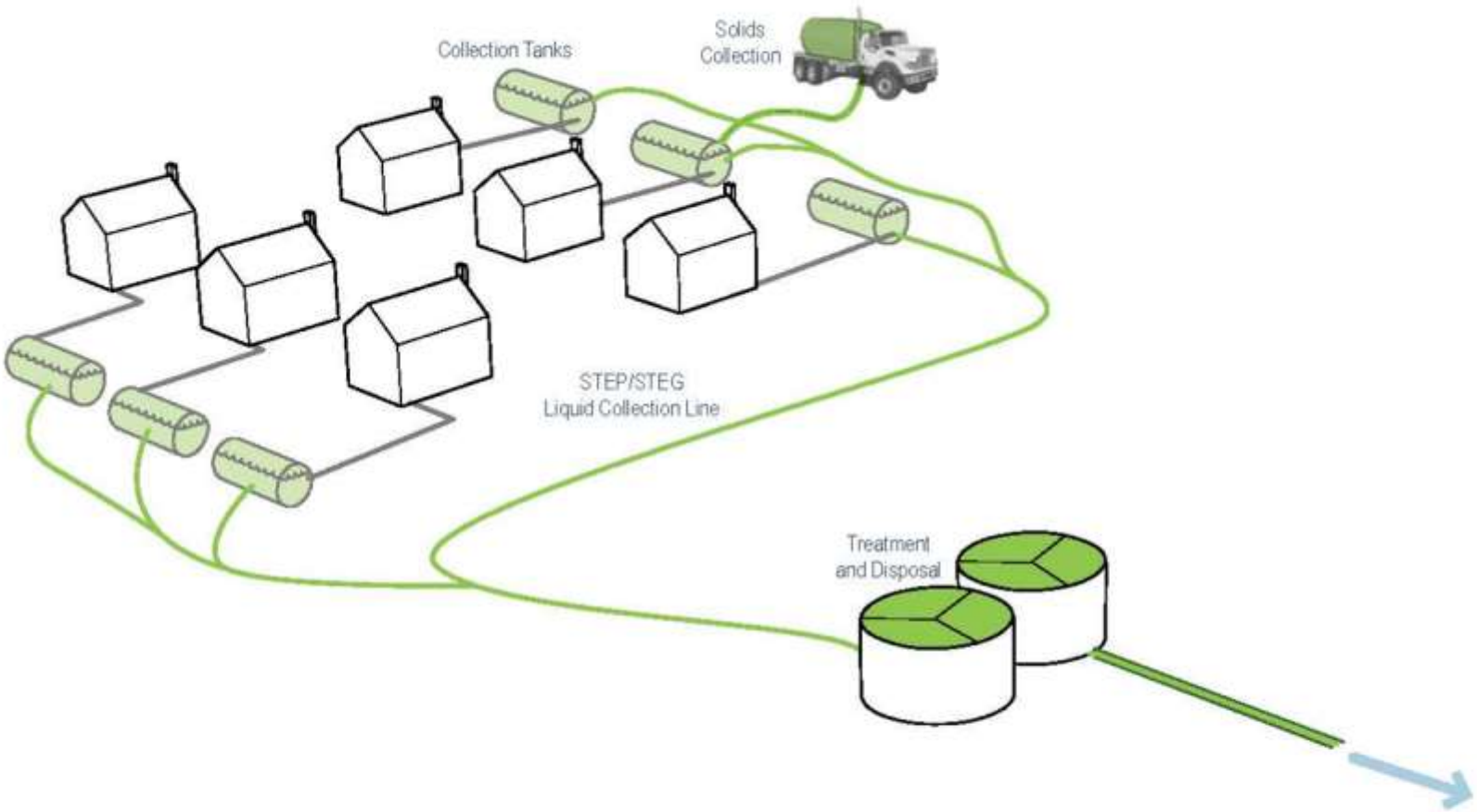


Scale: NEIGHBORHOOD
Target: WASTEWATER

Cluster & Satellite
Treatment Systems



Scale: NEIGHBORHOOD
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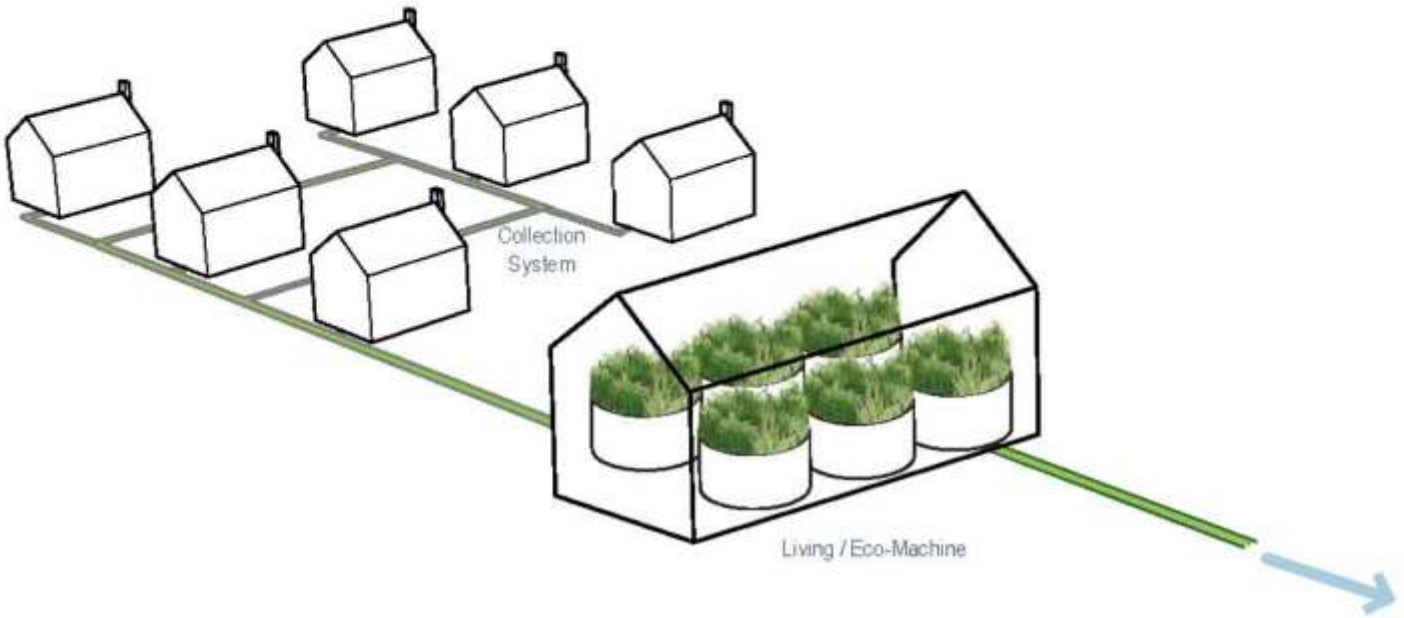
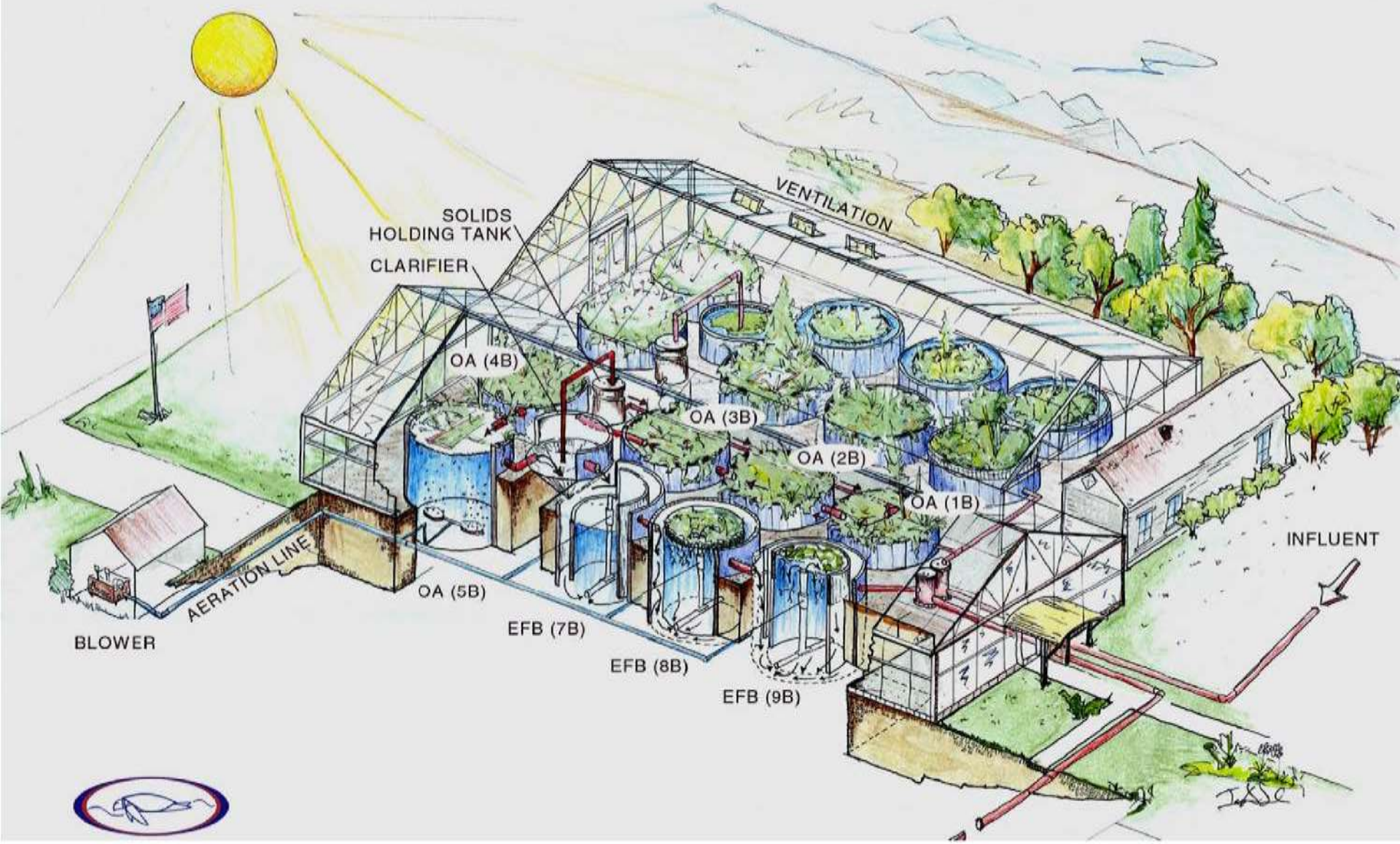
STEP / STEG Collection

STEP/
STEG



Scale: NEIGHBORHOOD
Target: WASTEWATER

Eco-Machines and
Living Machines

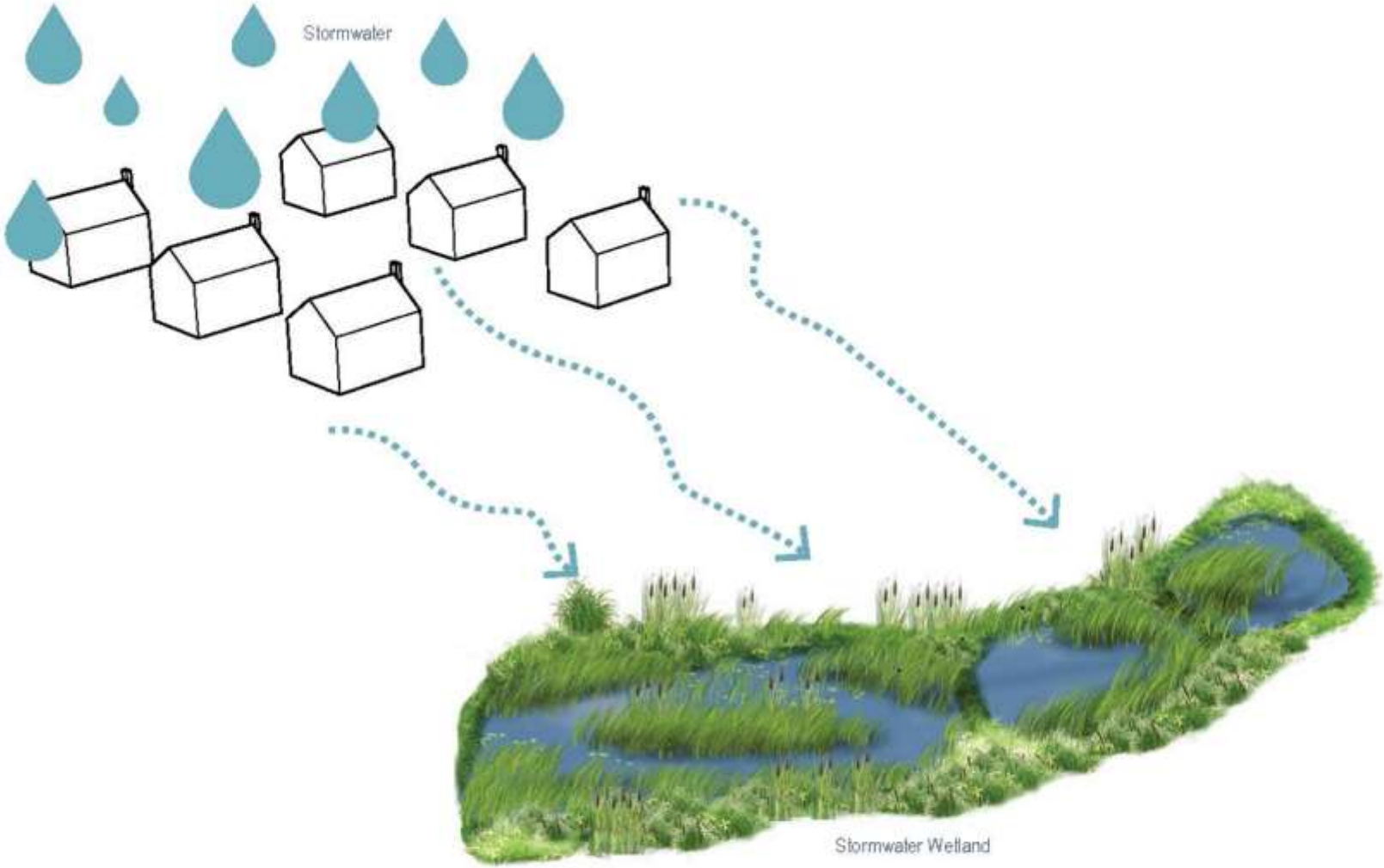


Precedent: Living Machine, South Burlington, VT
Source: Todd Ecological

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

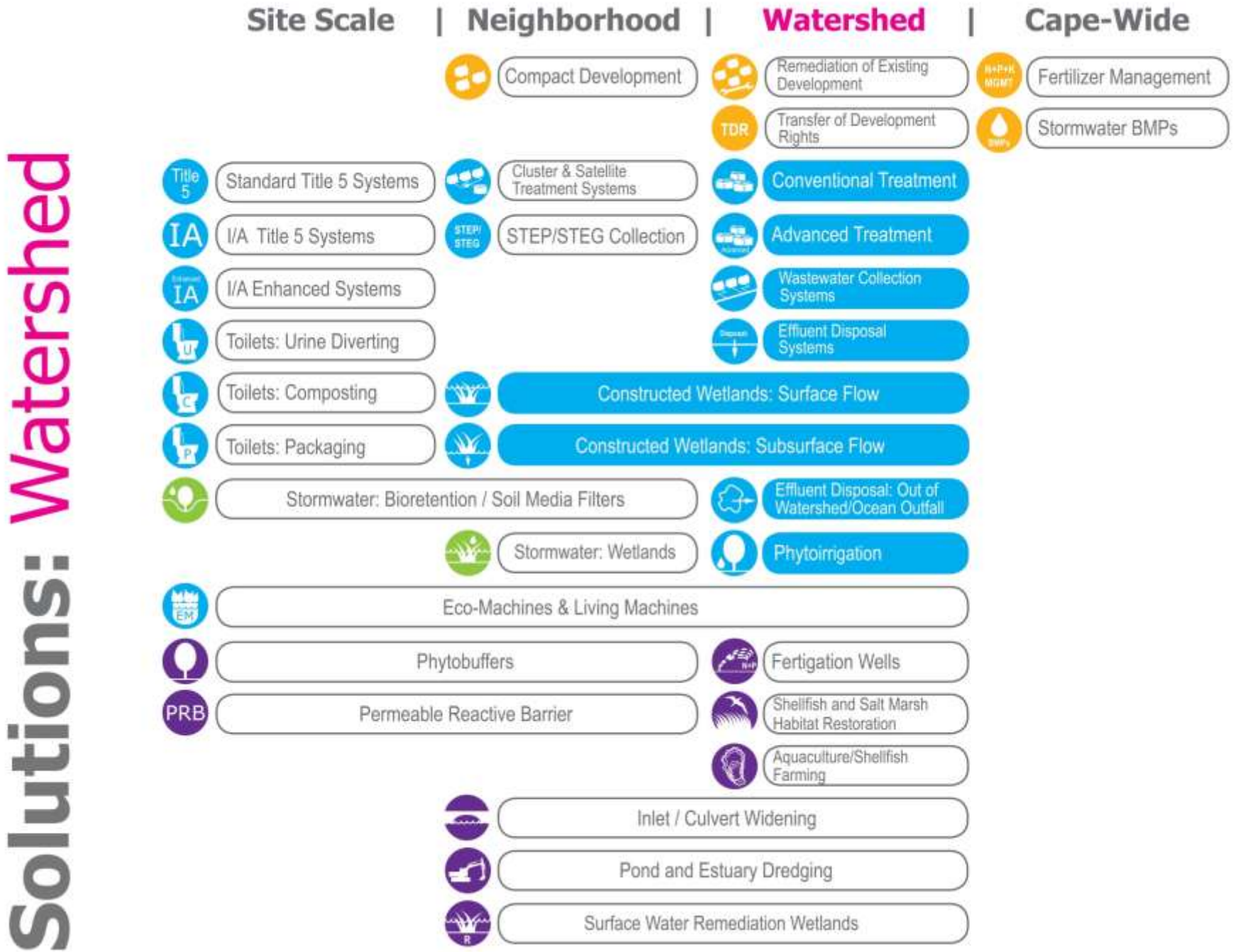


Scale: NEIGHBORHOOD
Target: STORMWATER

Stormwater Wetlands

Precedent: Missouri
Source: AECOM

Stormwater Wetlands


Solutions: Watershed
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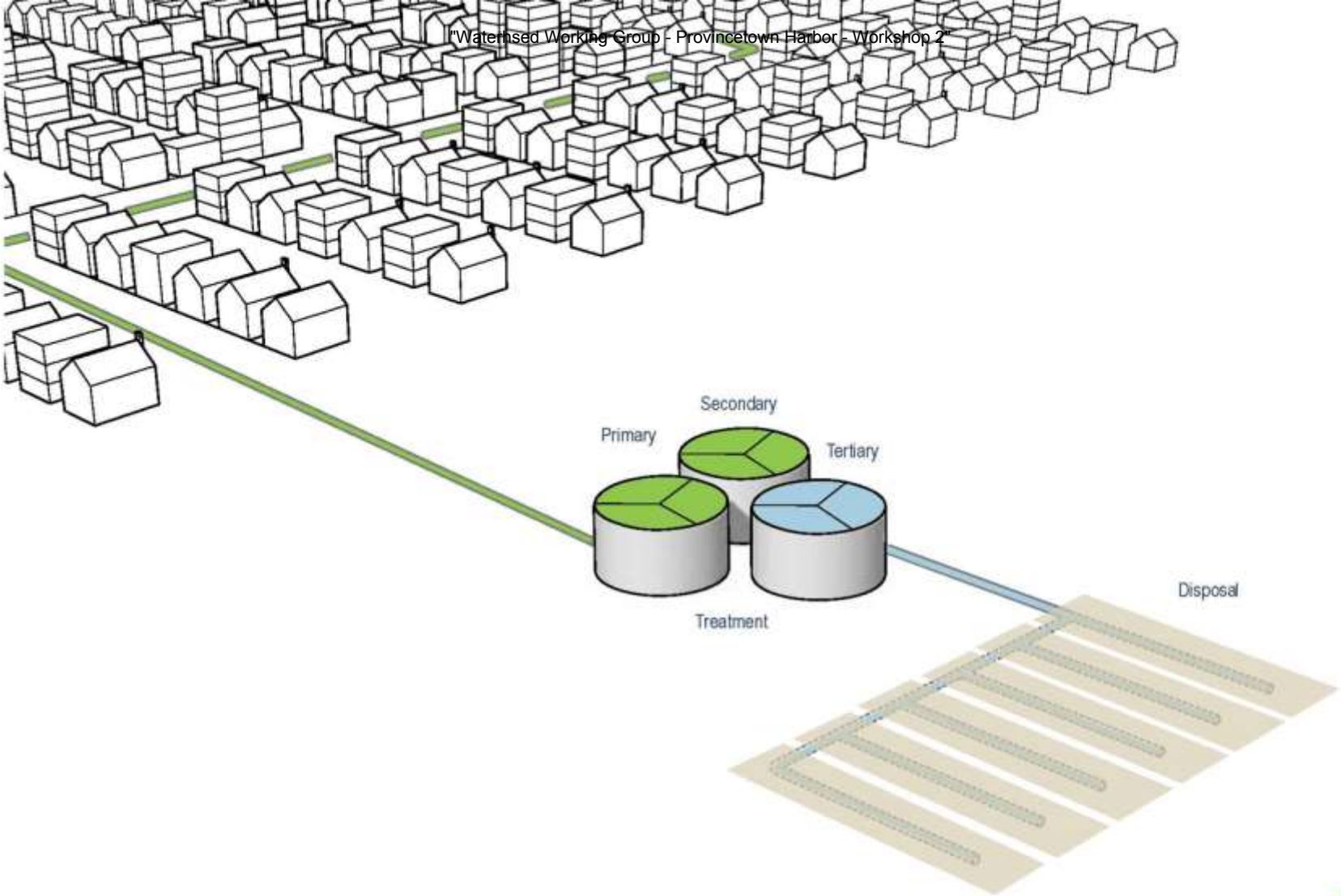
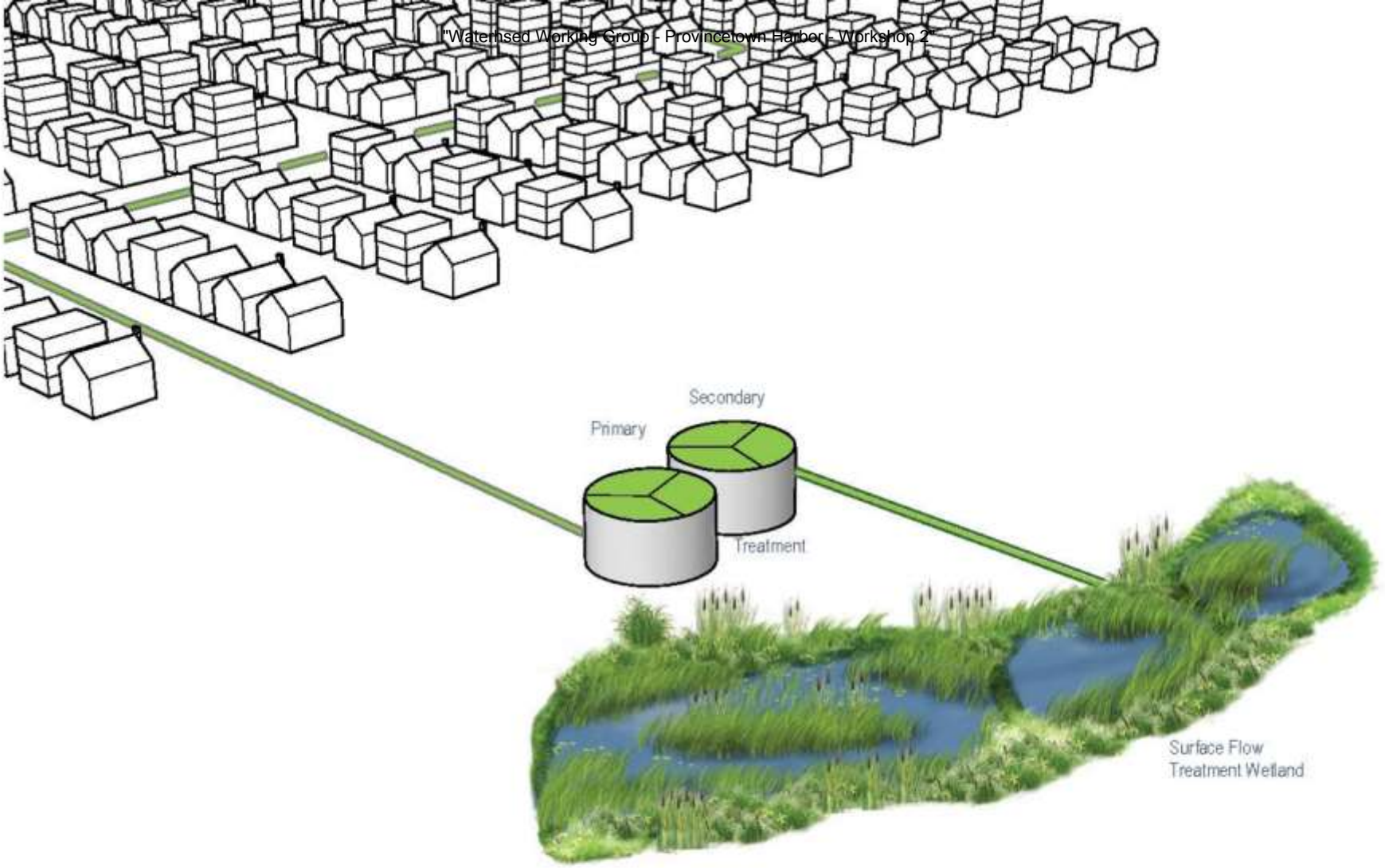


Scale: WATERSHED
Target: WASTEWATER

Conventional Treatment

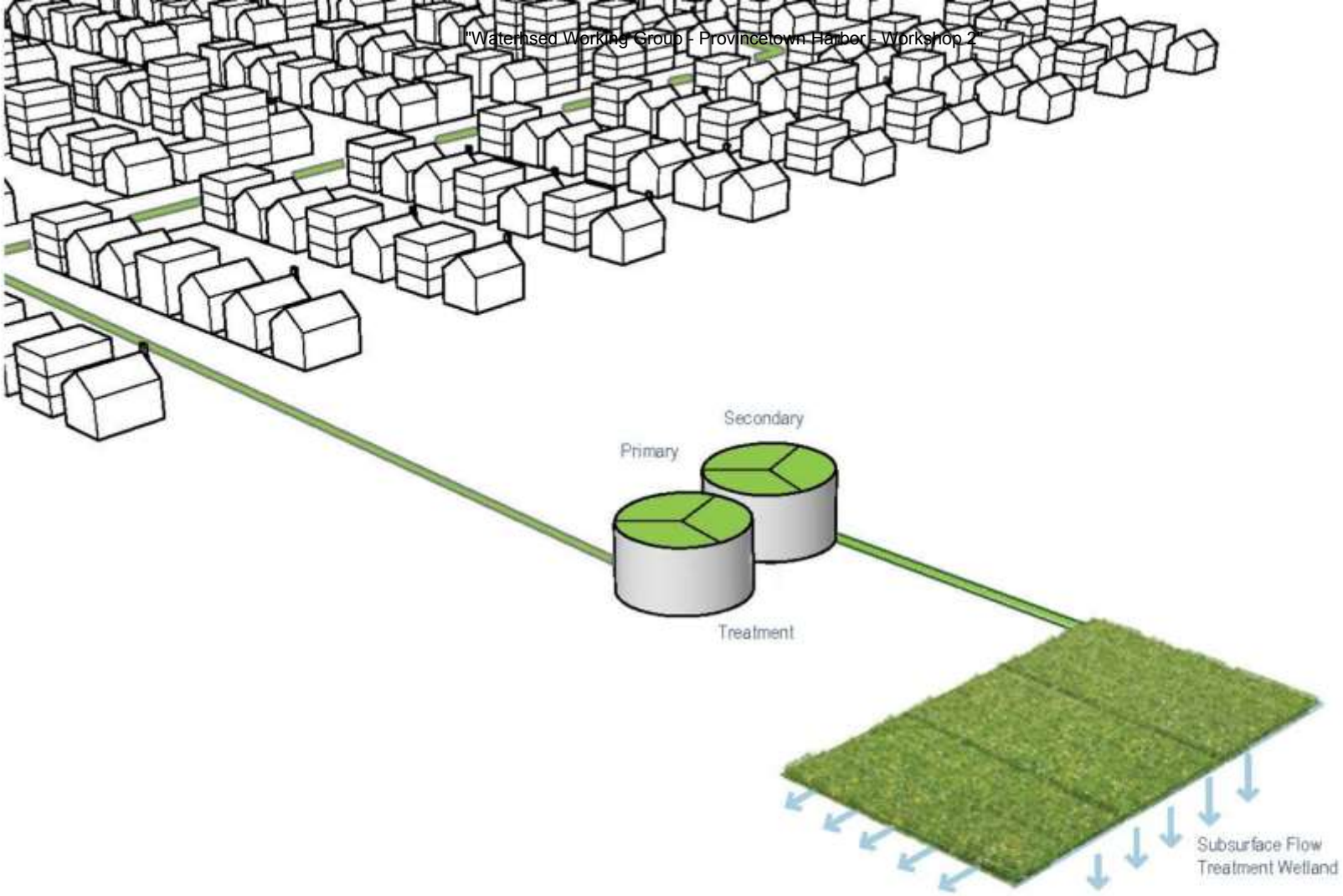


Scale: WATERSHED
Target: WASTEWATER

Constructed Wetlands:
Surface Flow

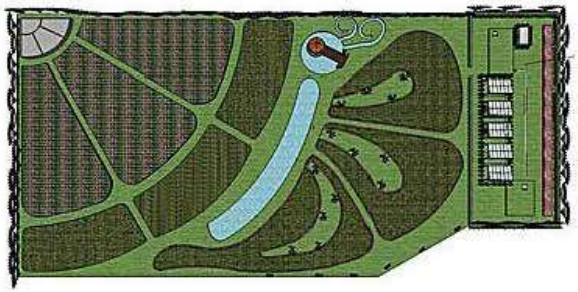
Precedent: Talking Waters Garden - Albany, OR
Source: Kate Kennen

Constructed Wetlands:
Surface Flow



Scale: WATERSHED
Target: WASTEWATER

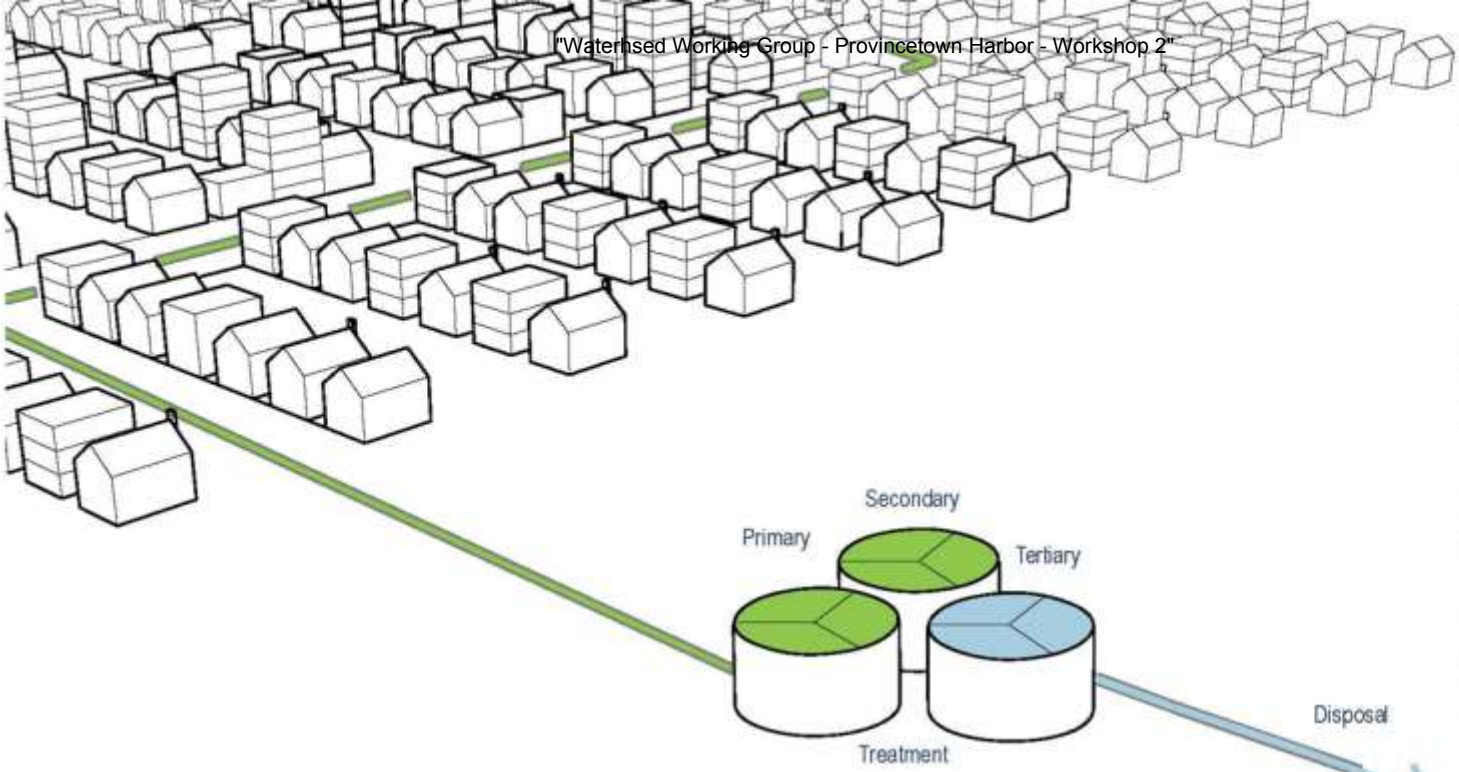
Constructed Wetlands
Subsurface Flow

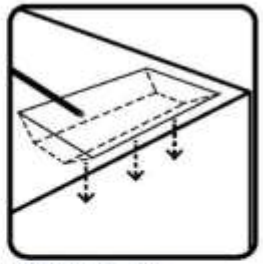


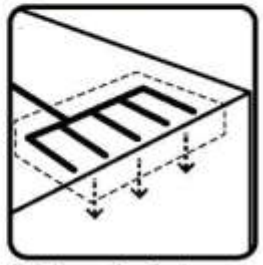
Precedent: Koh Phi Phi Treatment Wetland, Thailand

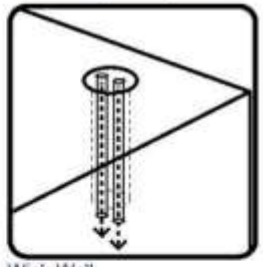
Source: Hans Brix

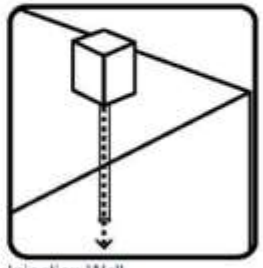
Constructed Wetlands:
Subsurface Flow




Infiltration Basins


Soil Absorption System

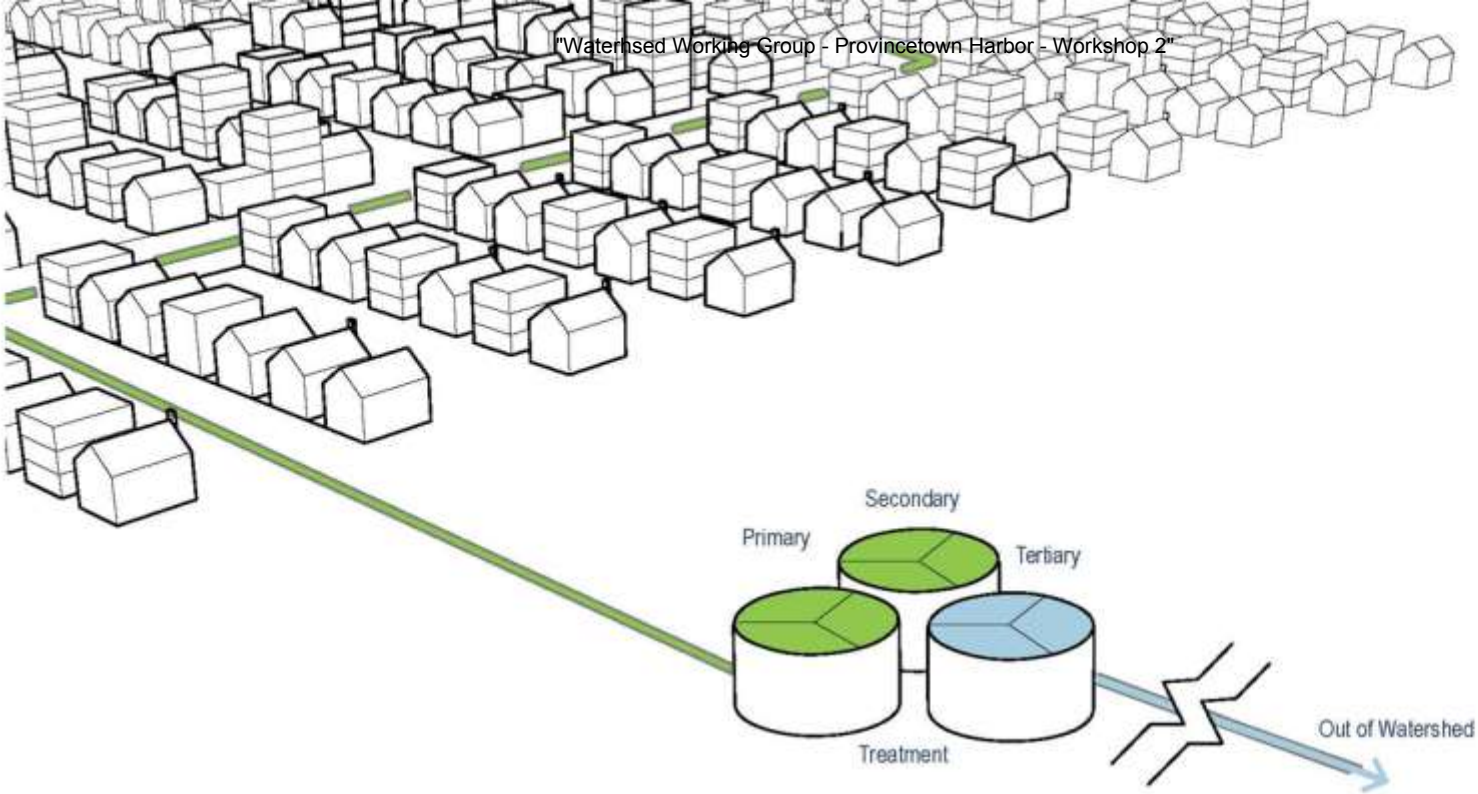

Wick Well


Injection Well

Scale: WATERSHED
Target: WASTEWATER

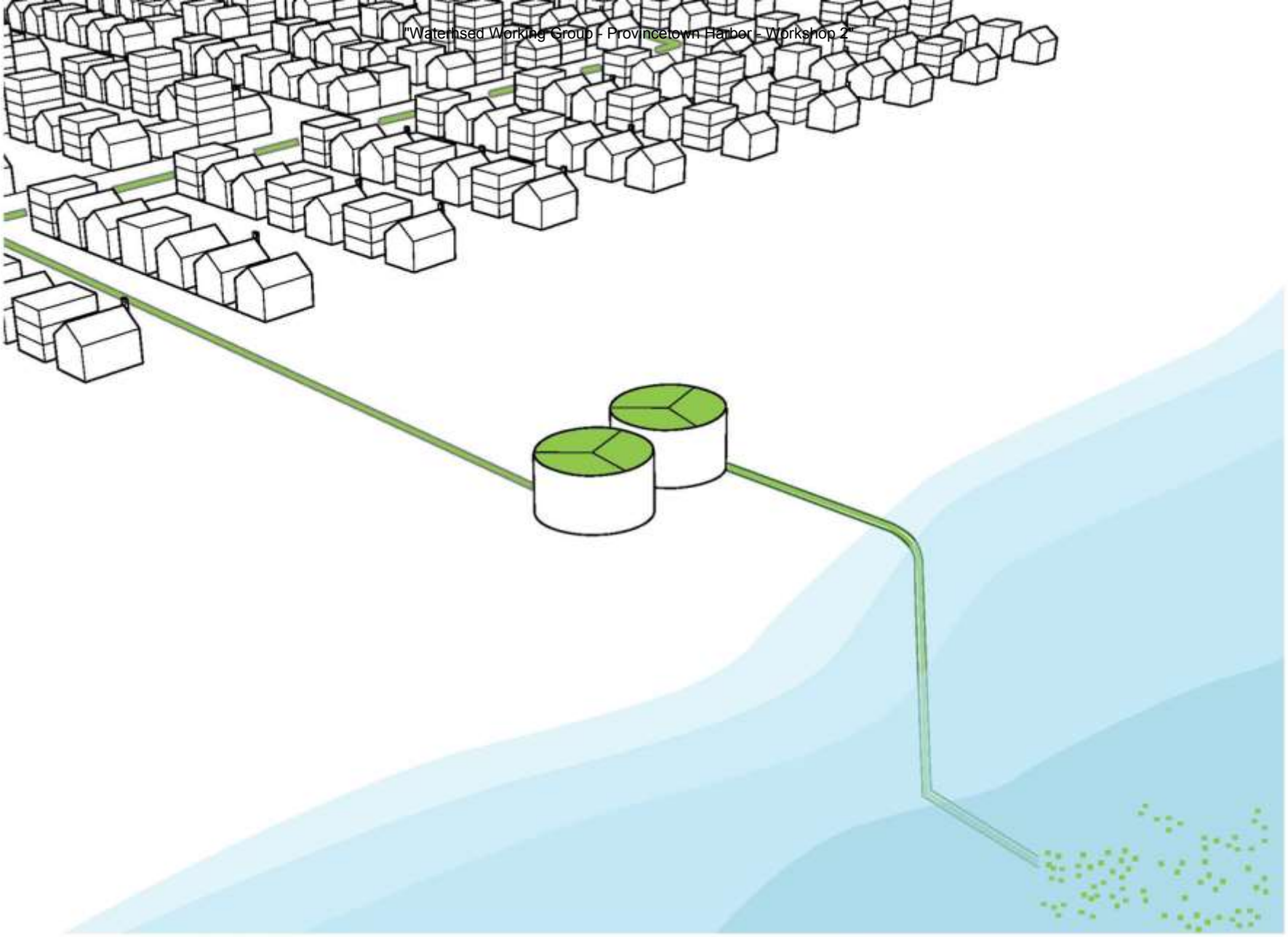
Effluent Disposal Systems

Disposal:



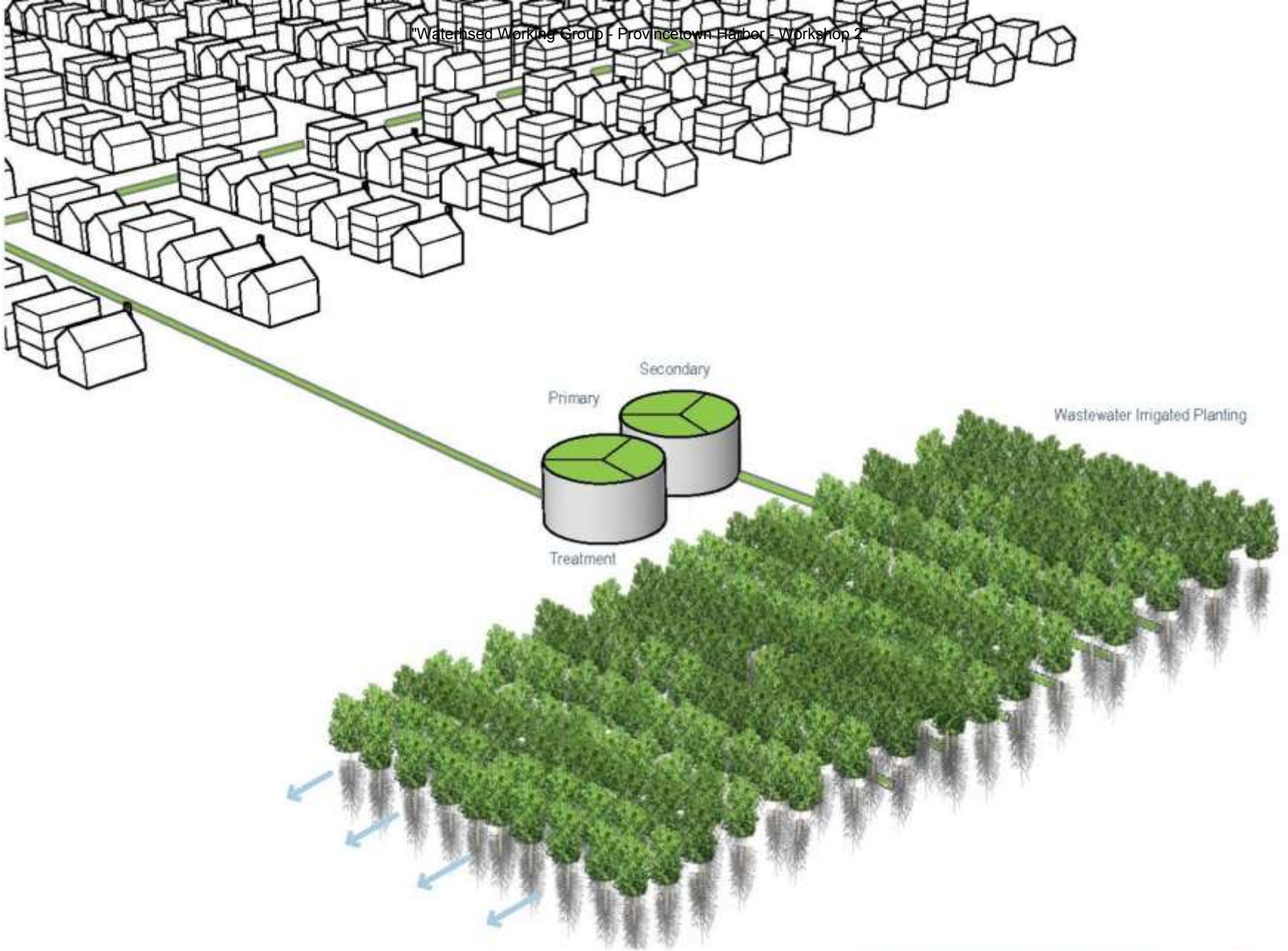
Scale: WATERSHED
Target: WASTEWATER

Effluent Disposal: Out of Watershed



Scale: WATERSHED
Target: WASTEWATER

Effluent Disposal: Ocean Outfall



Scale: WATERSHED
Target: WASTEWATER

Phytoirrigation

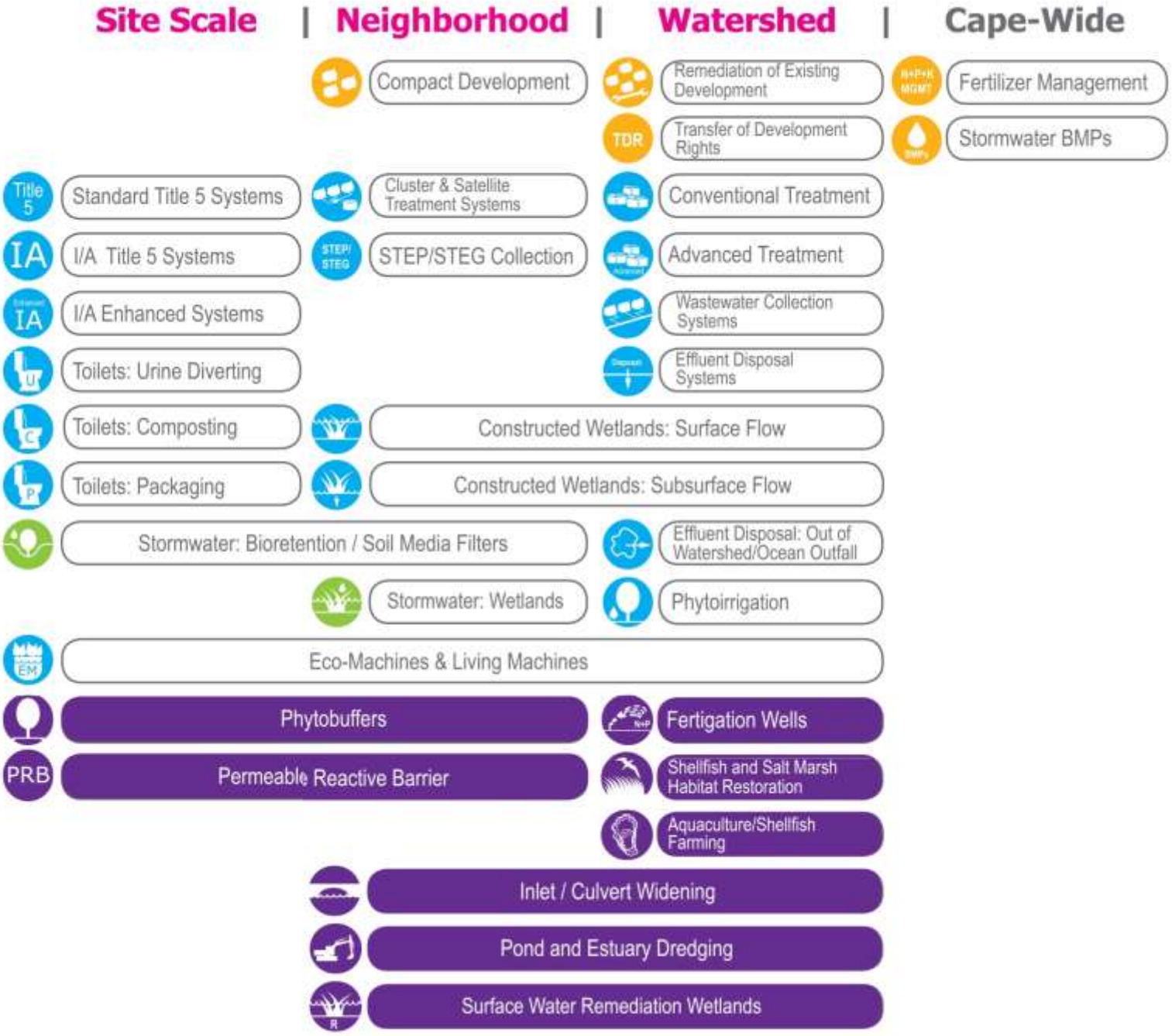
Precedent: Woodburn OR, Wastewater Treatment Facility
Source: CH2MHill

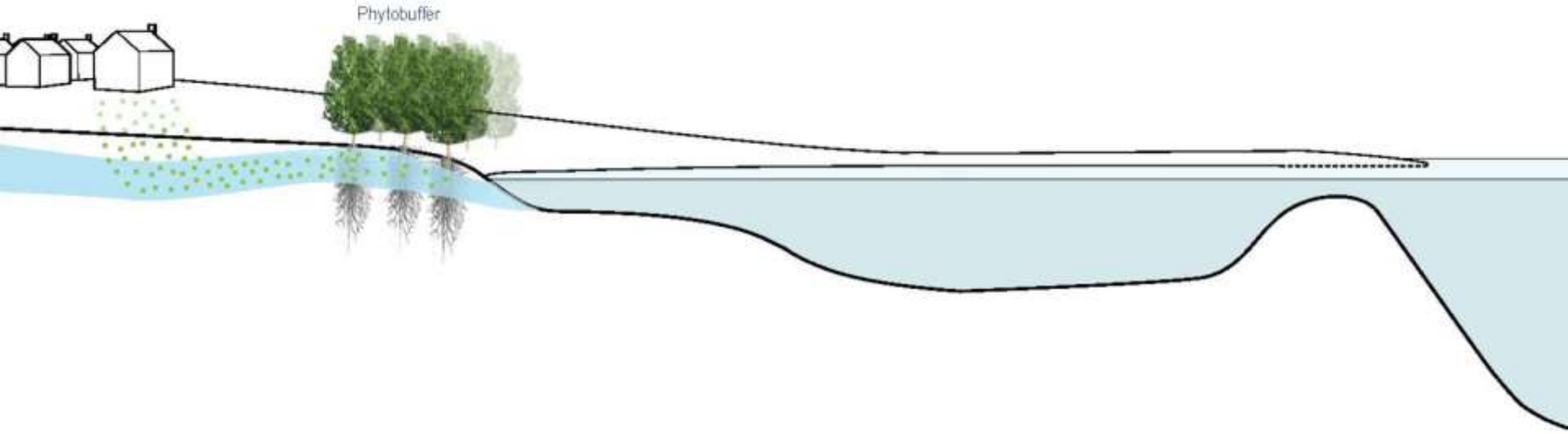
Phytoirrigation

Precedent: Woodburn OR, Wastewater Treatment Facility
Source: CH2MHill

Phytoirrigation

Solutions: Ex. Water



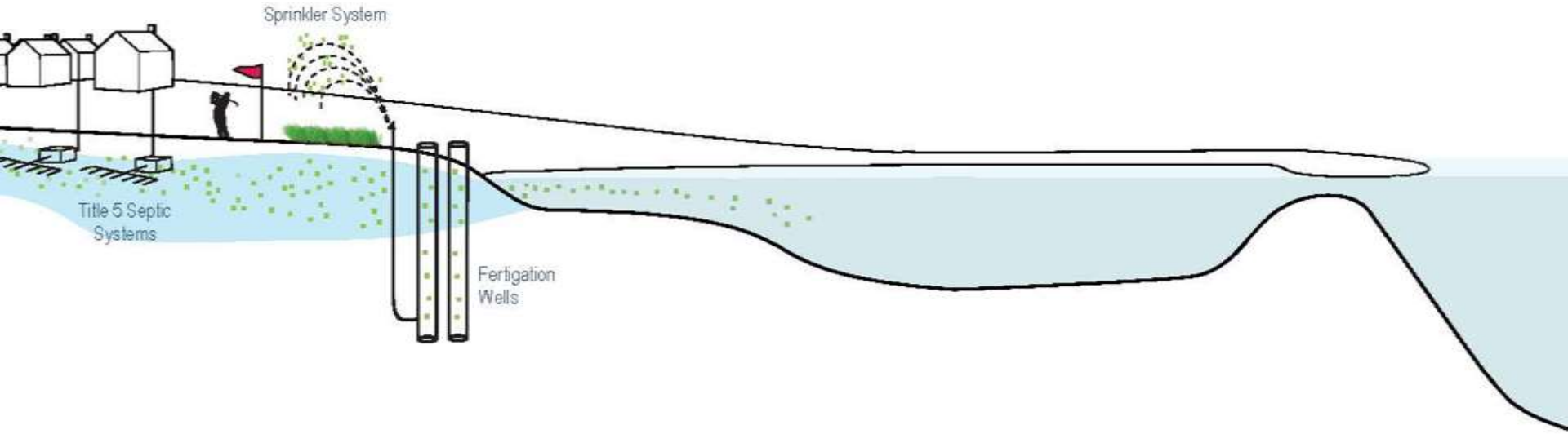


Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Phytobuffers

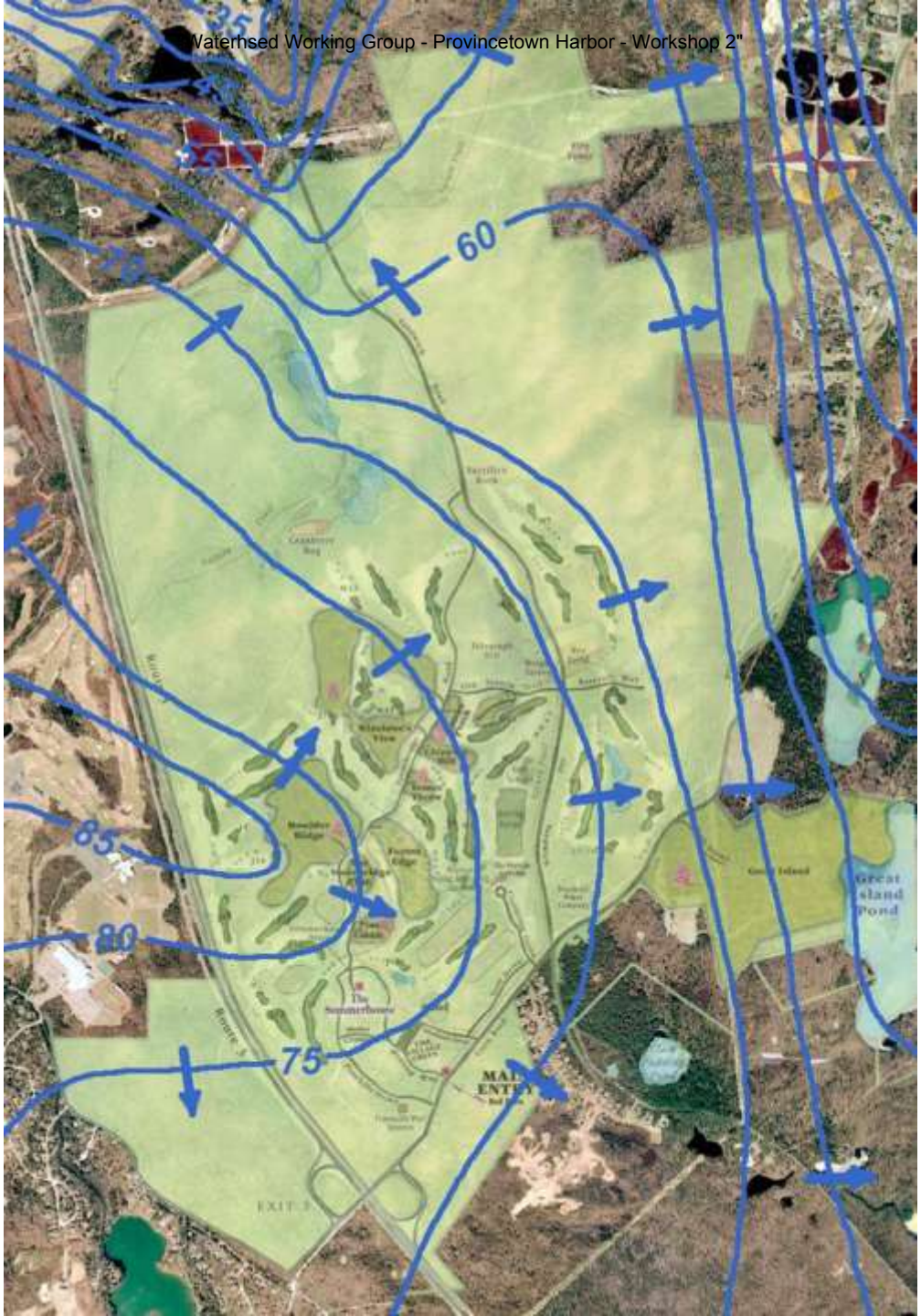
Precedent: Phytobuffer - Kavcee, WY
Source: Sand Creek Consultants

Phytobuffers

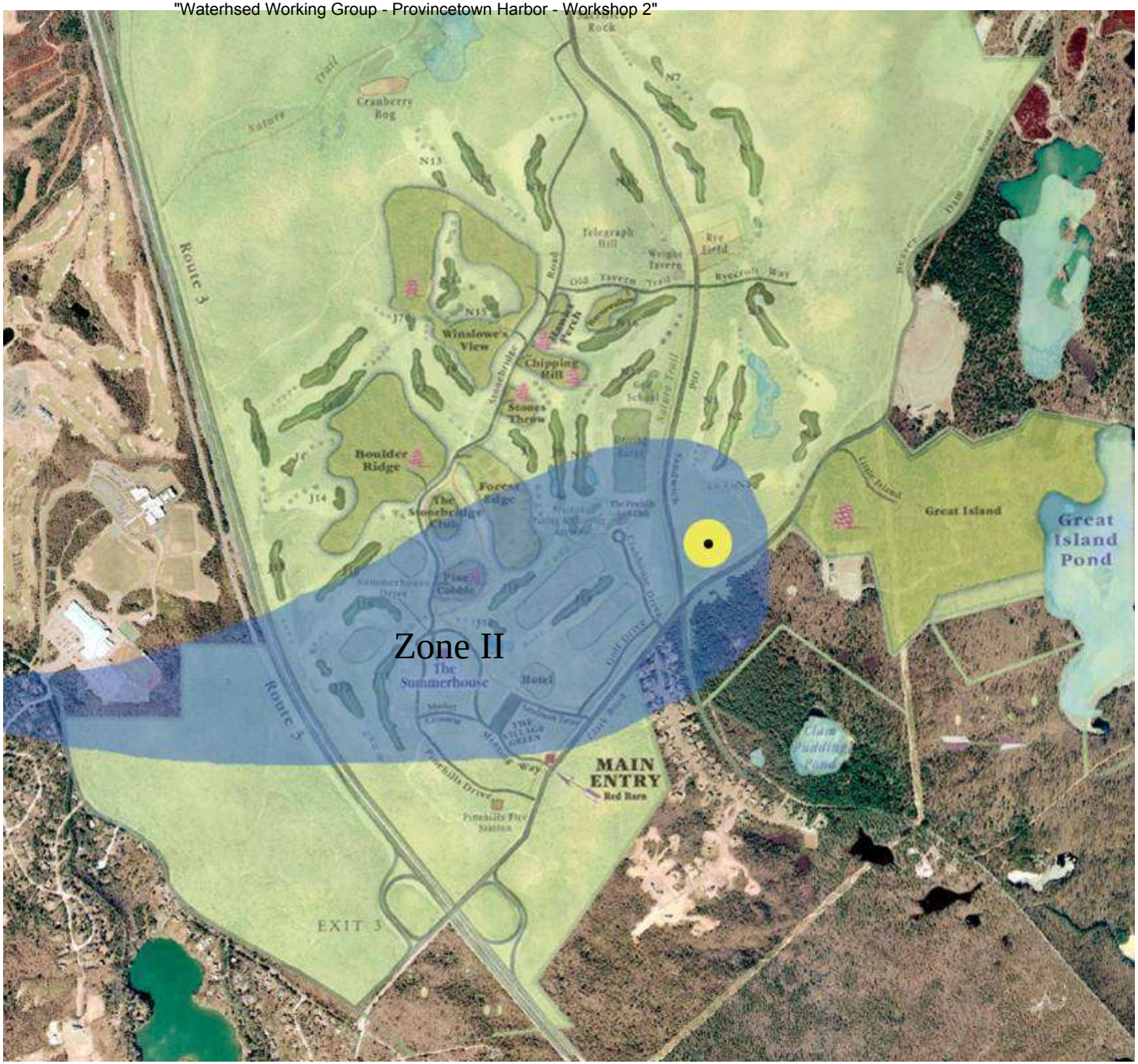


Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Fertigation Wells



Precedent:
Pine Hills
Plymouth, MA



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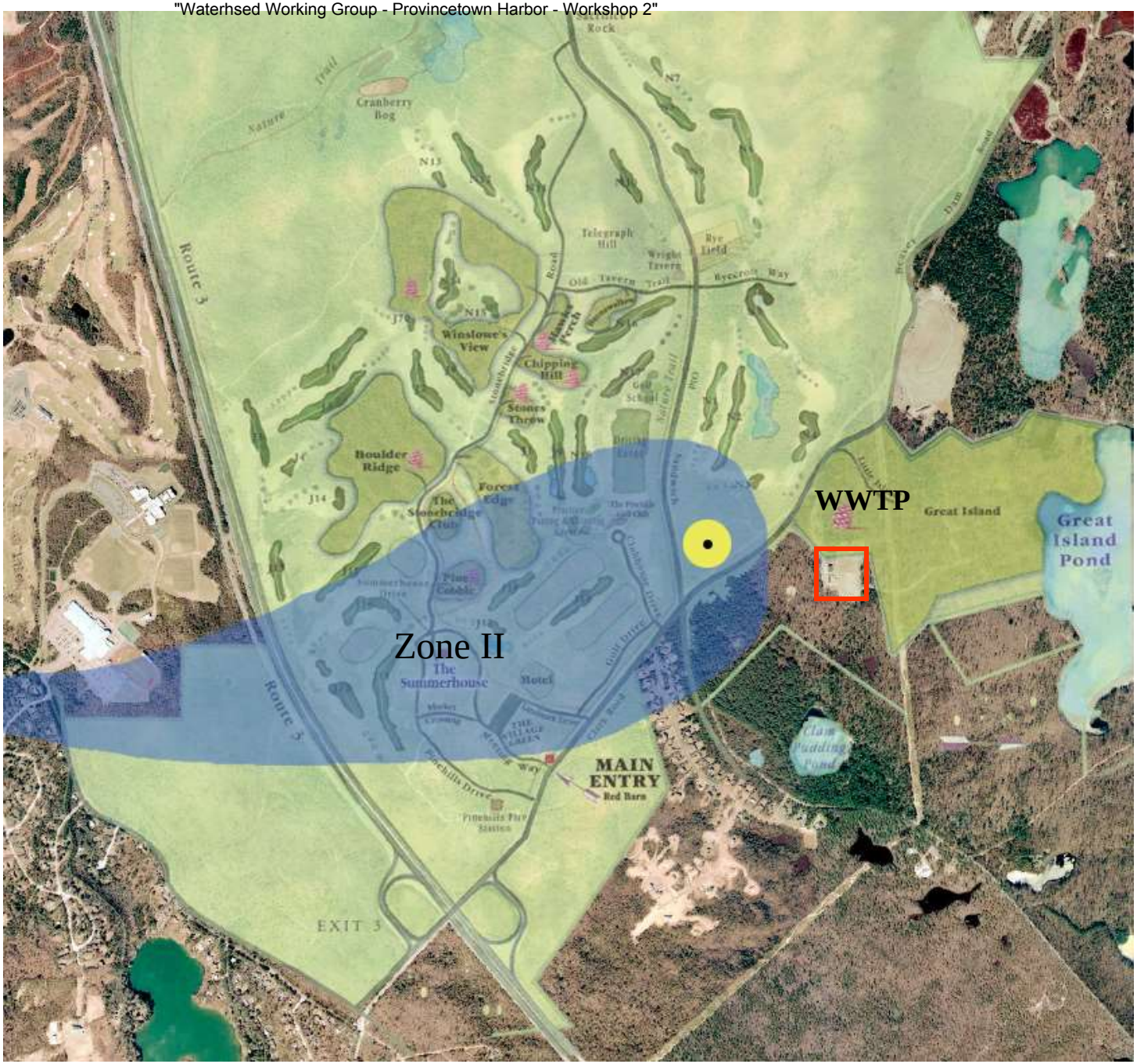

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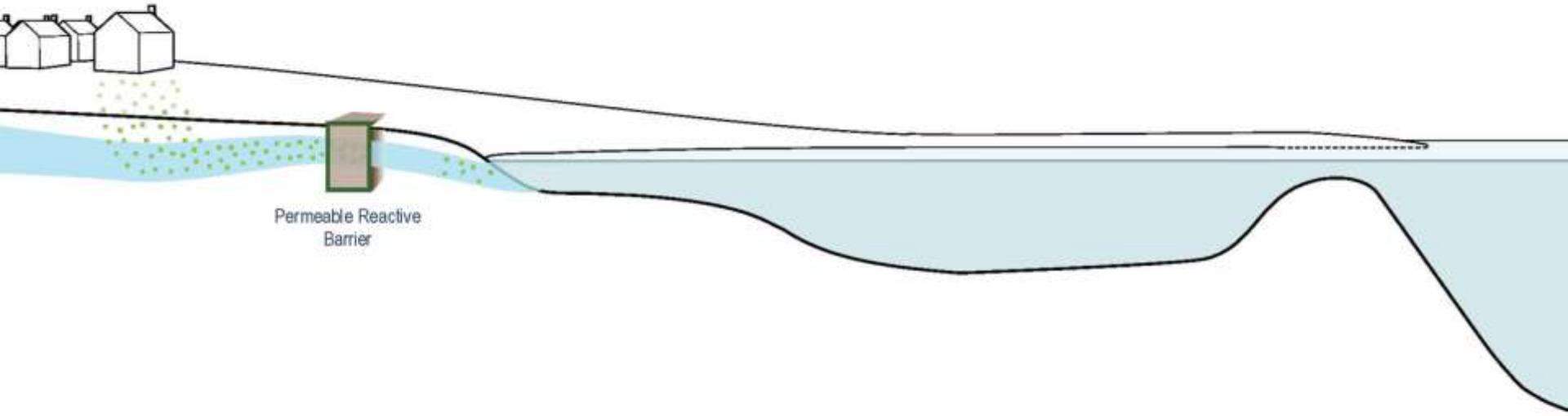
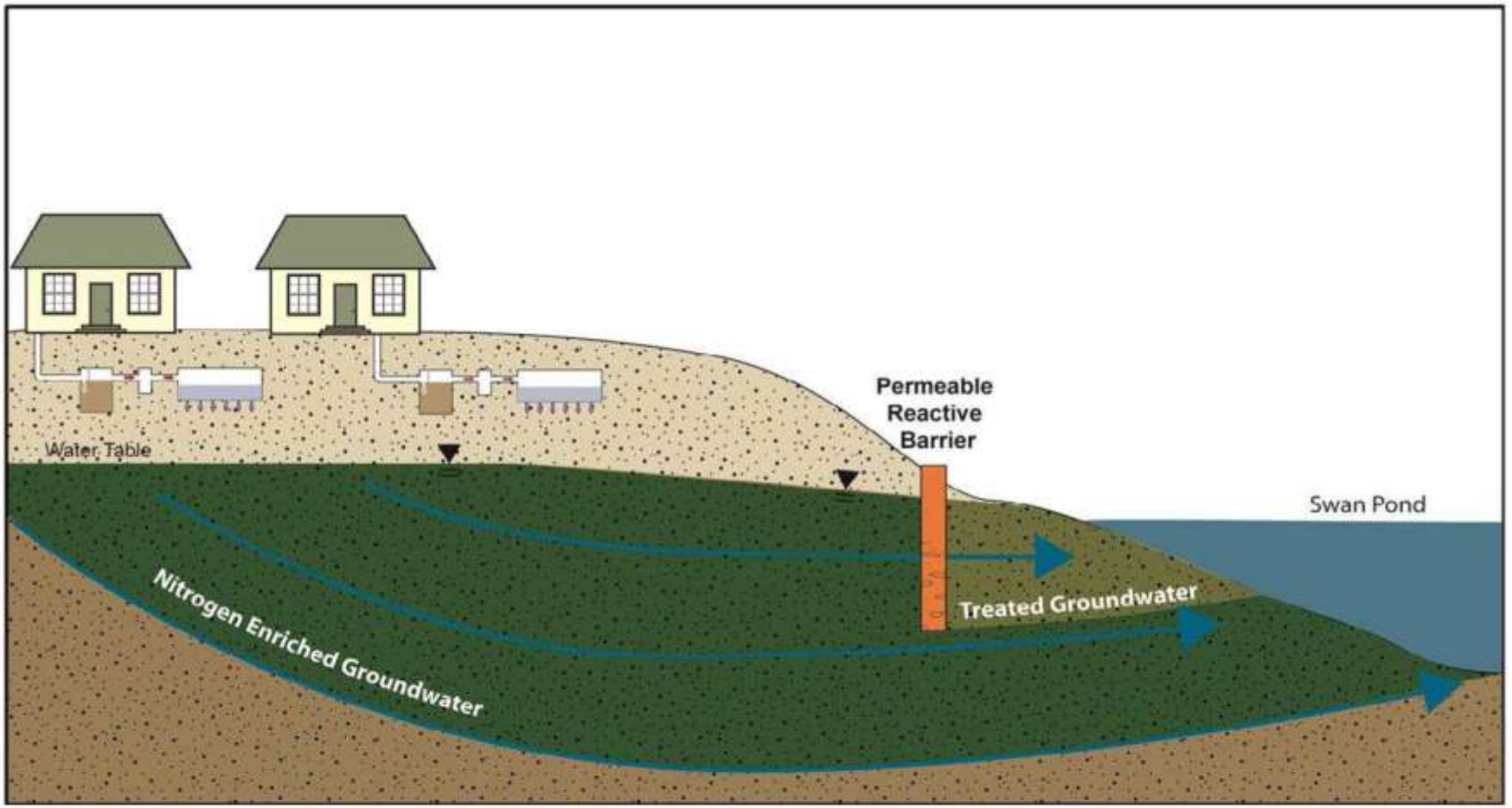


Scale: SITE / NEIGHBORHOOD / WATERSHED
Target: EXISTING WATER BODIES

Permeable Reactive Barrier PRB

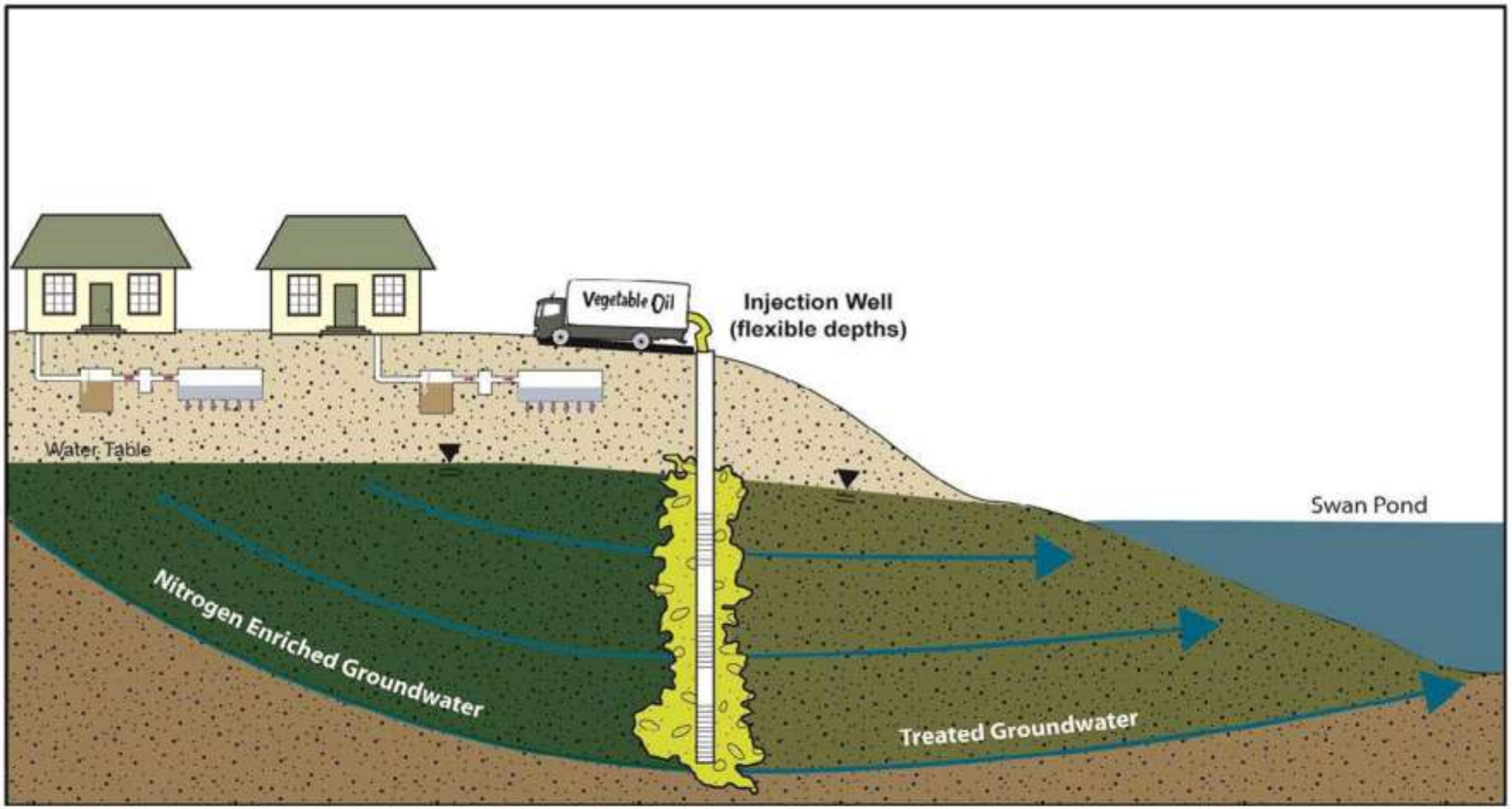


Precedent: PRB
Source: Horsley Witten Group Inc.

Permeable Reactive Barrier PRB

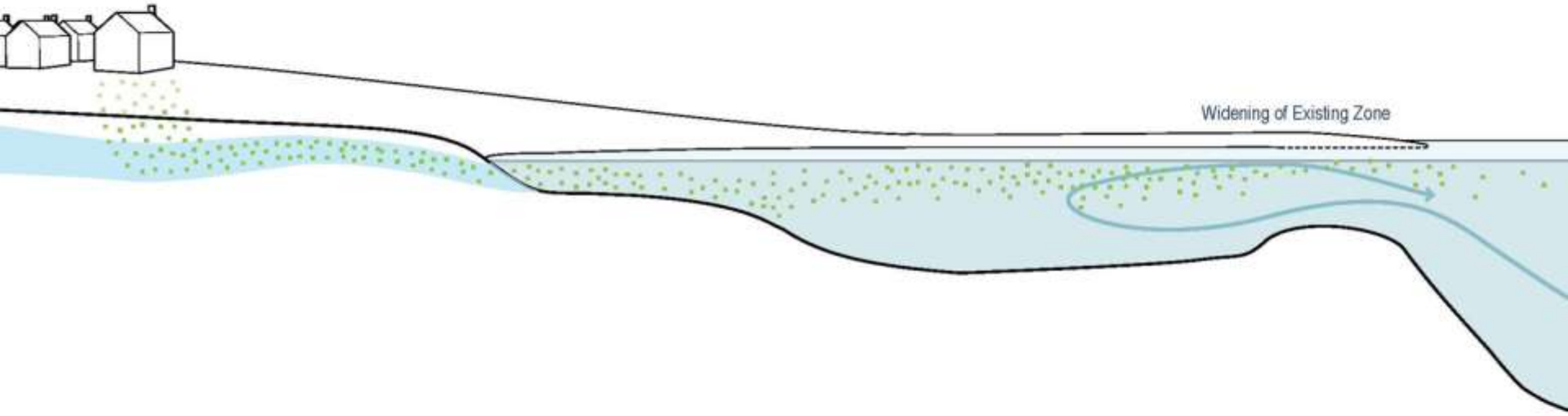
Precedent: Falmouth PRB
Source: Mike Domenica

Permeable Reactive Barrier PRB



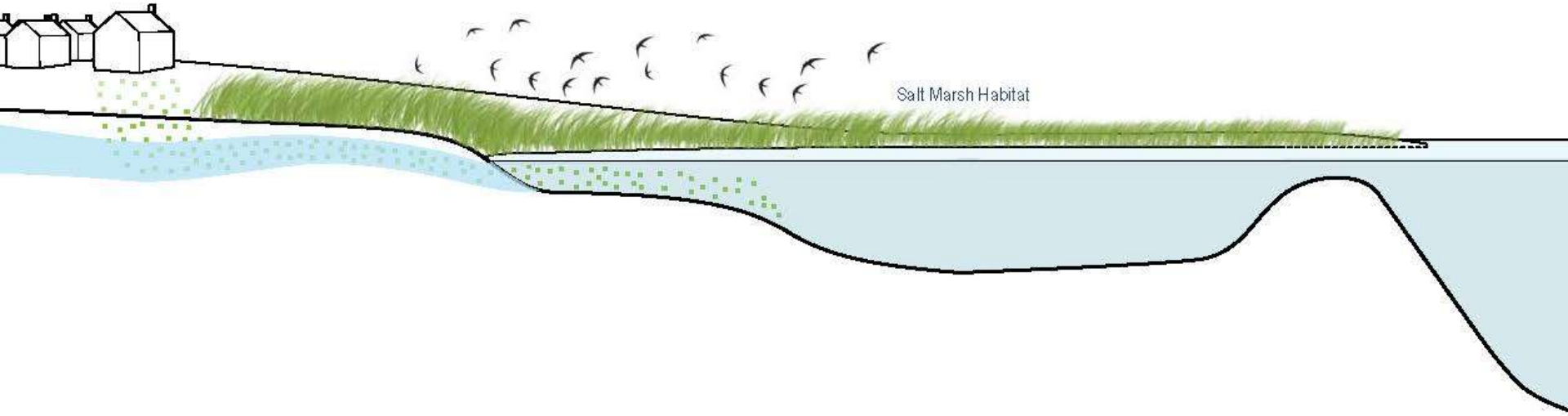
Precedent: PRB
Source: Horsley Witten Group Inc.

Permeable Reactive Barrier PRB



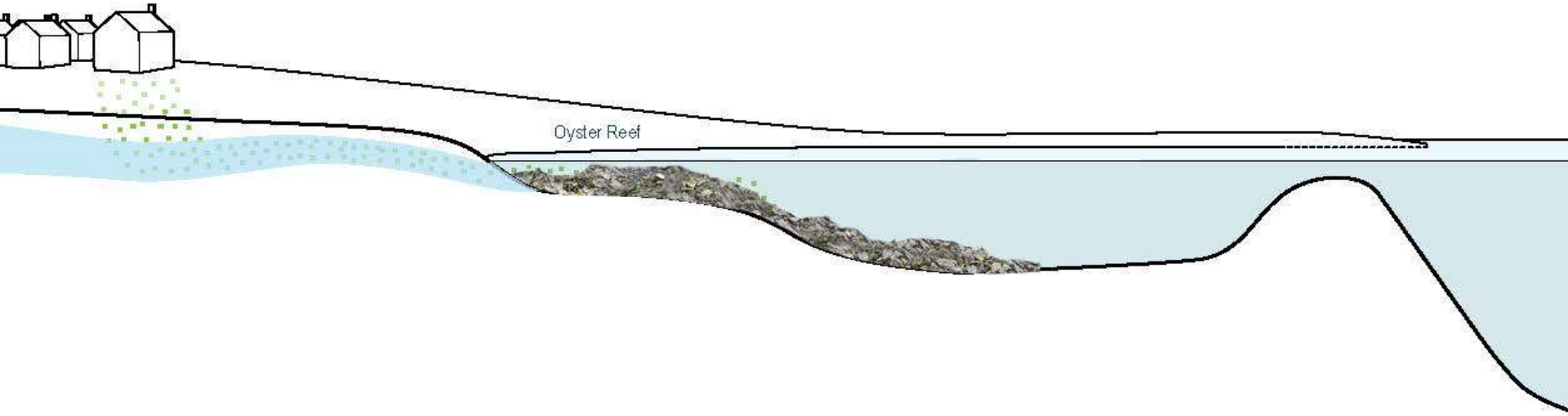
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

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

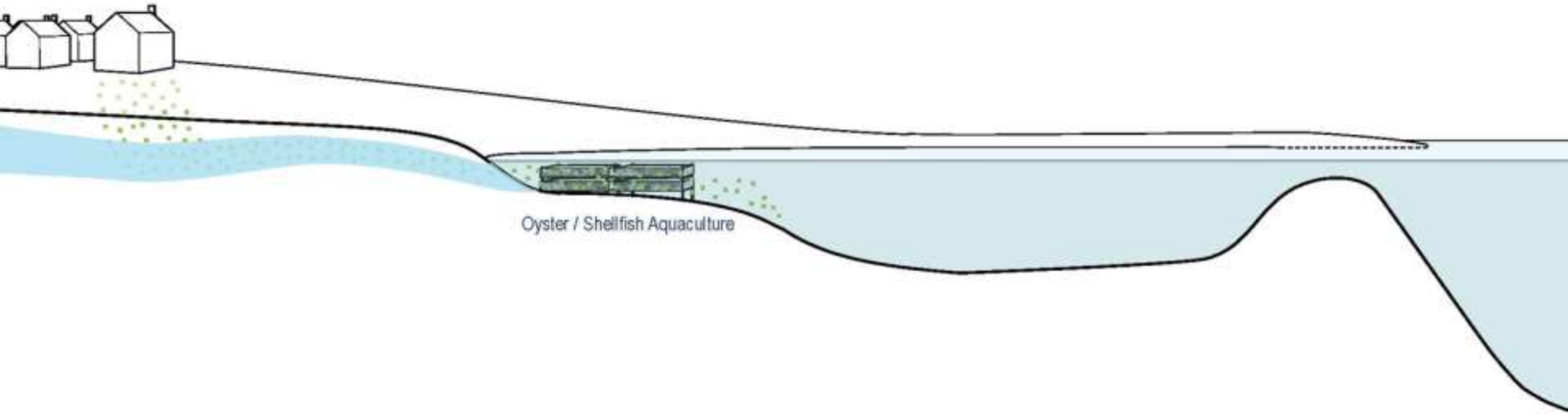
Precedent: Wellfleet Oyster Restoration Project
Source: Anamarija Francik

Shellfish Habitat Restoration

Precedent: Wellfleet Oyster Restoration Project

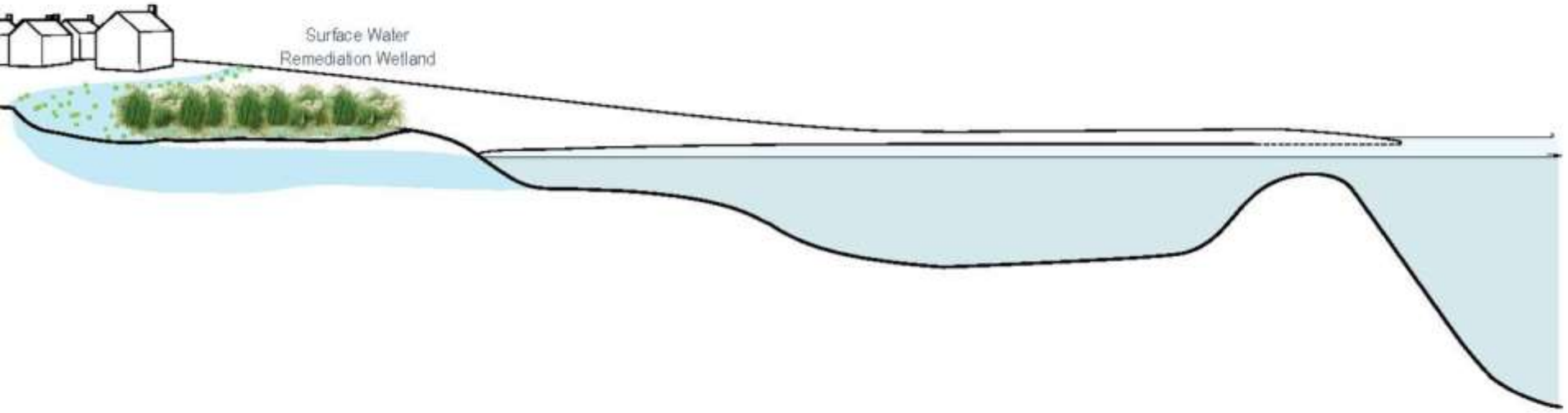
Source: Anamarija Francik

Shellfish Habitat Restoration



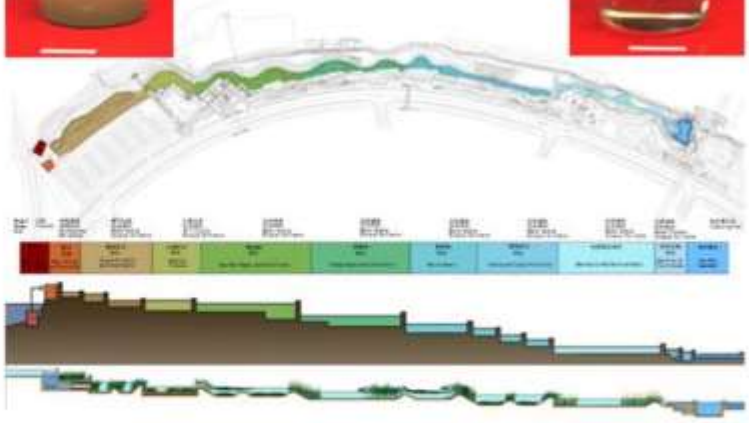
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

Aquaculture / Shellfish Farming



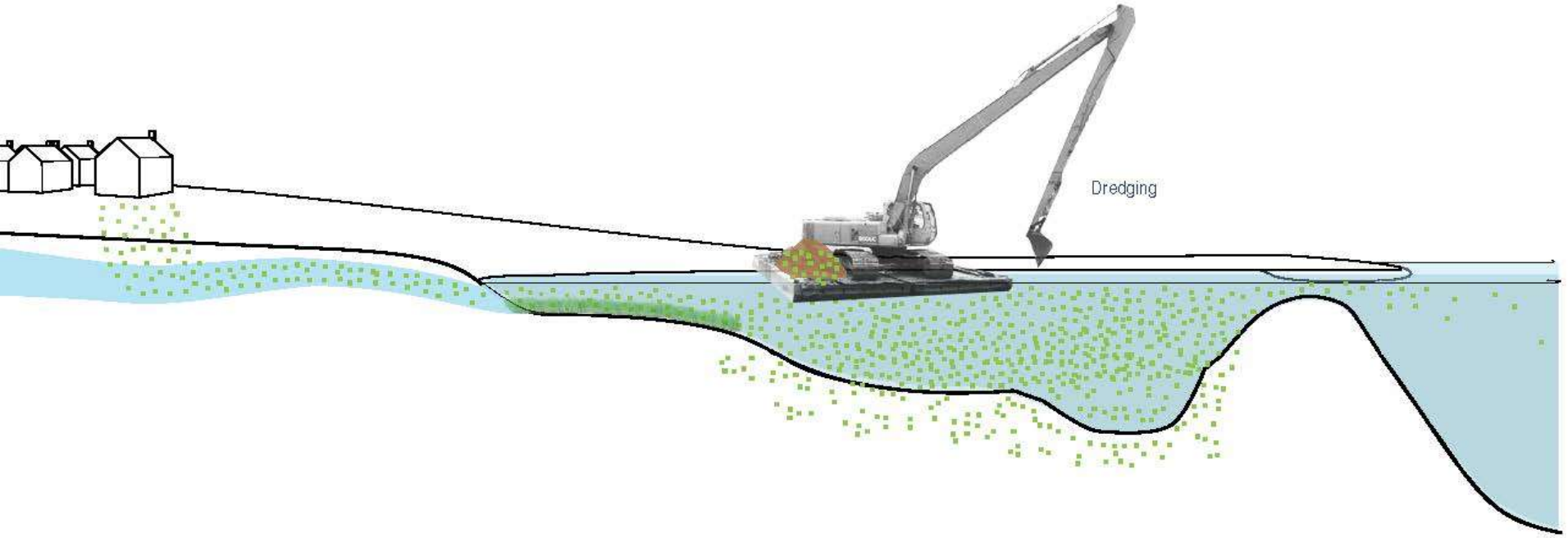
Scale: NEIGHBORHOOD/ WATERSHED
Target: EXISTING WATER BODIES

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

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

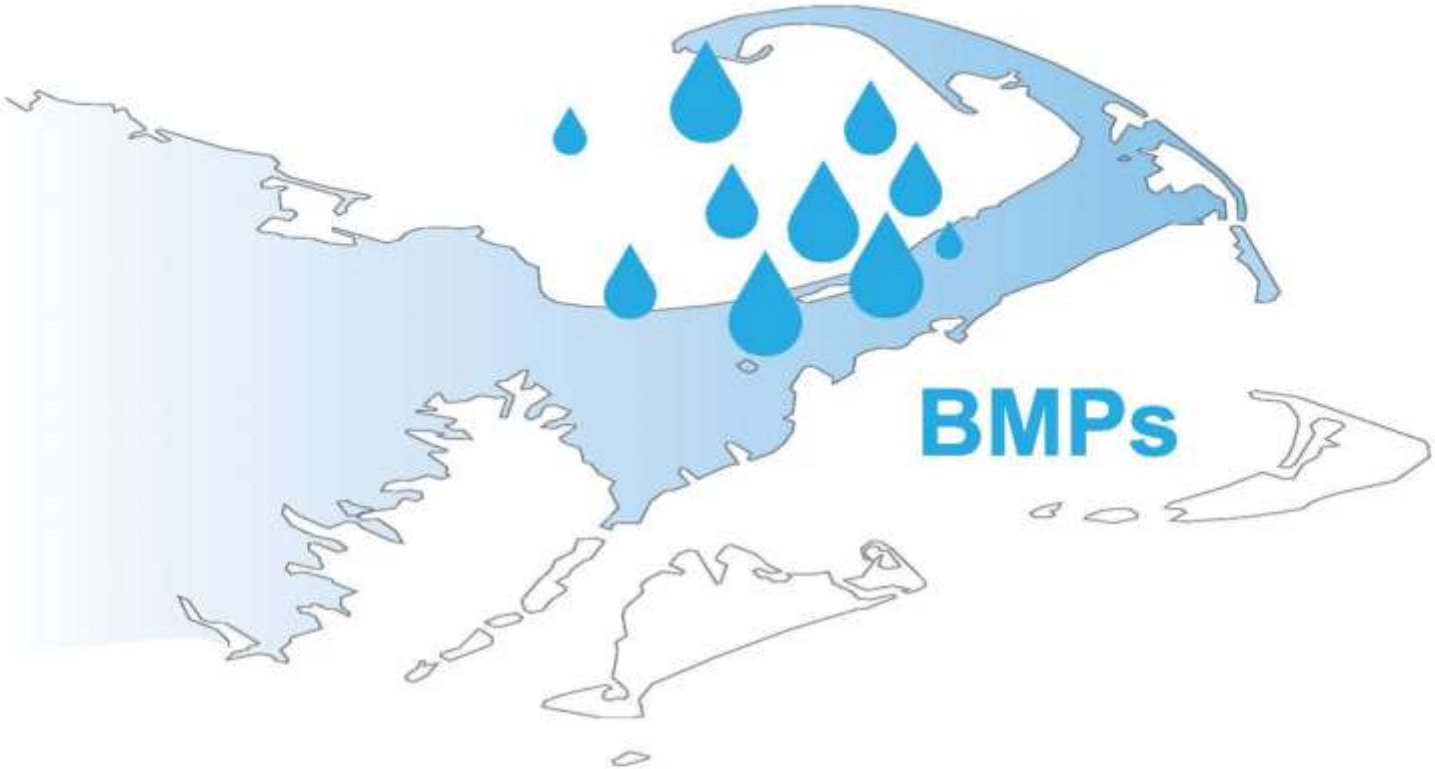
TDR

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

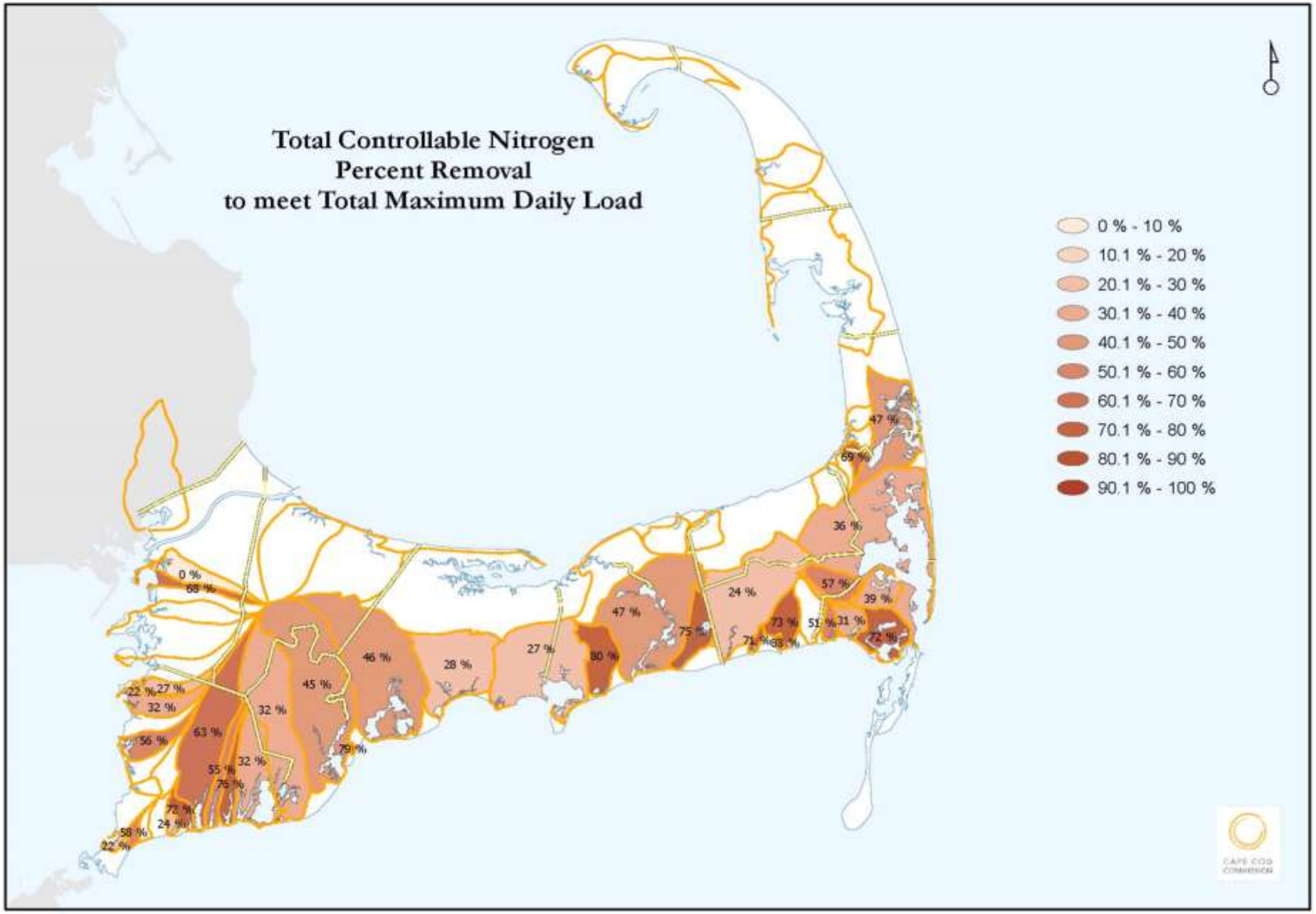
Town Consideration of Alternative Technologies & Approaches

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*

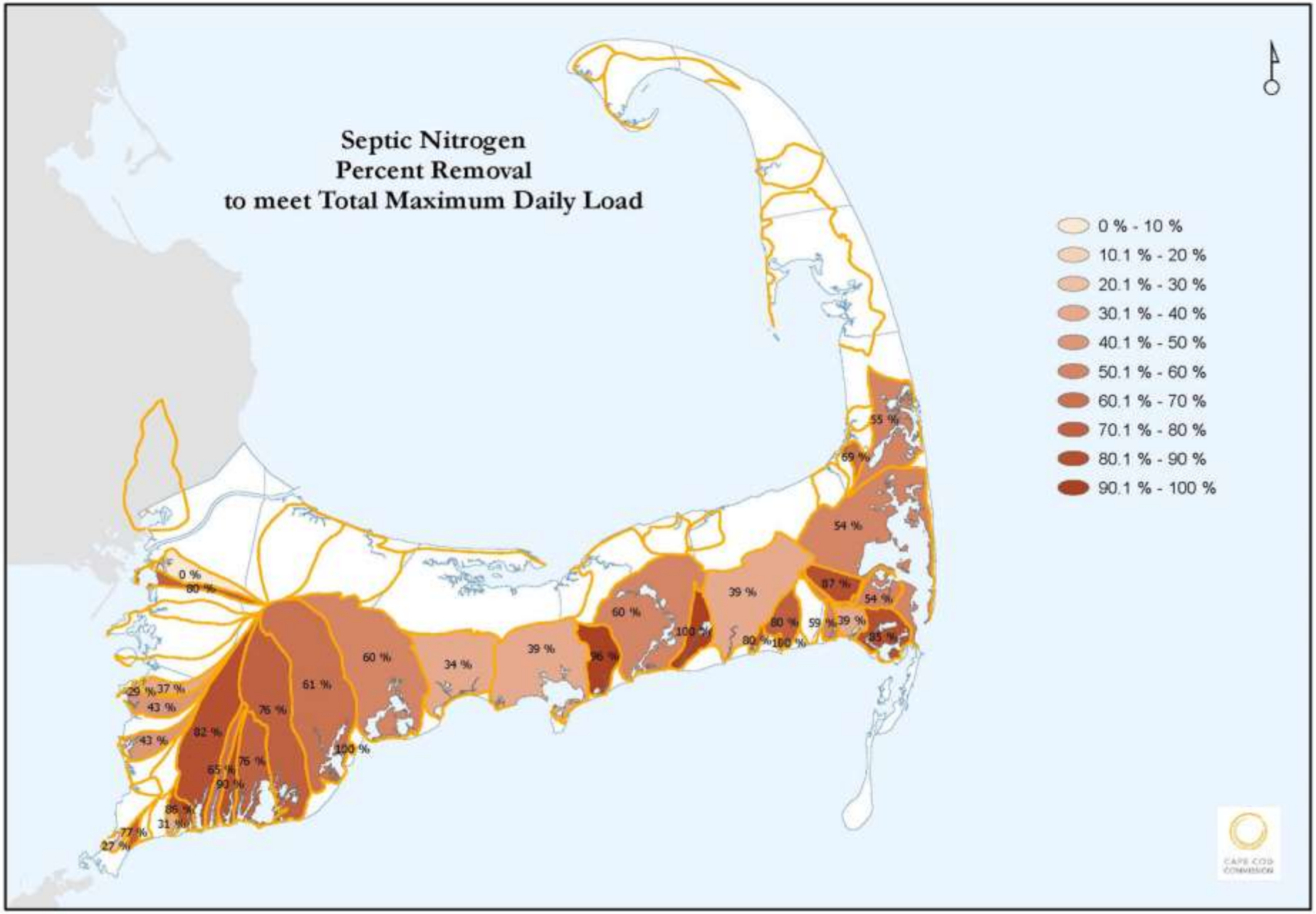

Site Scale | Neighborhood | Watershed | Cape-Wide
Solutions
Compact Development
Remediation of Existing Development
Fertilizer Management
TDR
Transfer of Development Rights
Stormwater BMPs
Title 5
Standard Title 5 Systems
Cluster & Satellite Treatment Systems
Conventional Treatment
IA
I/A Title 5 Systems
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

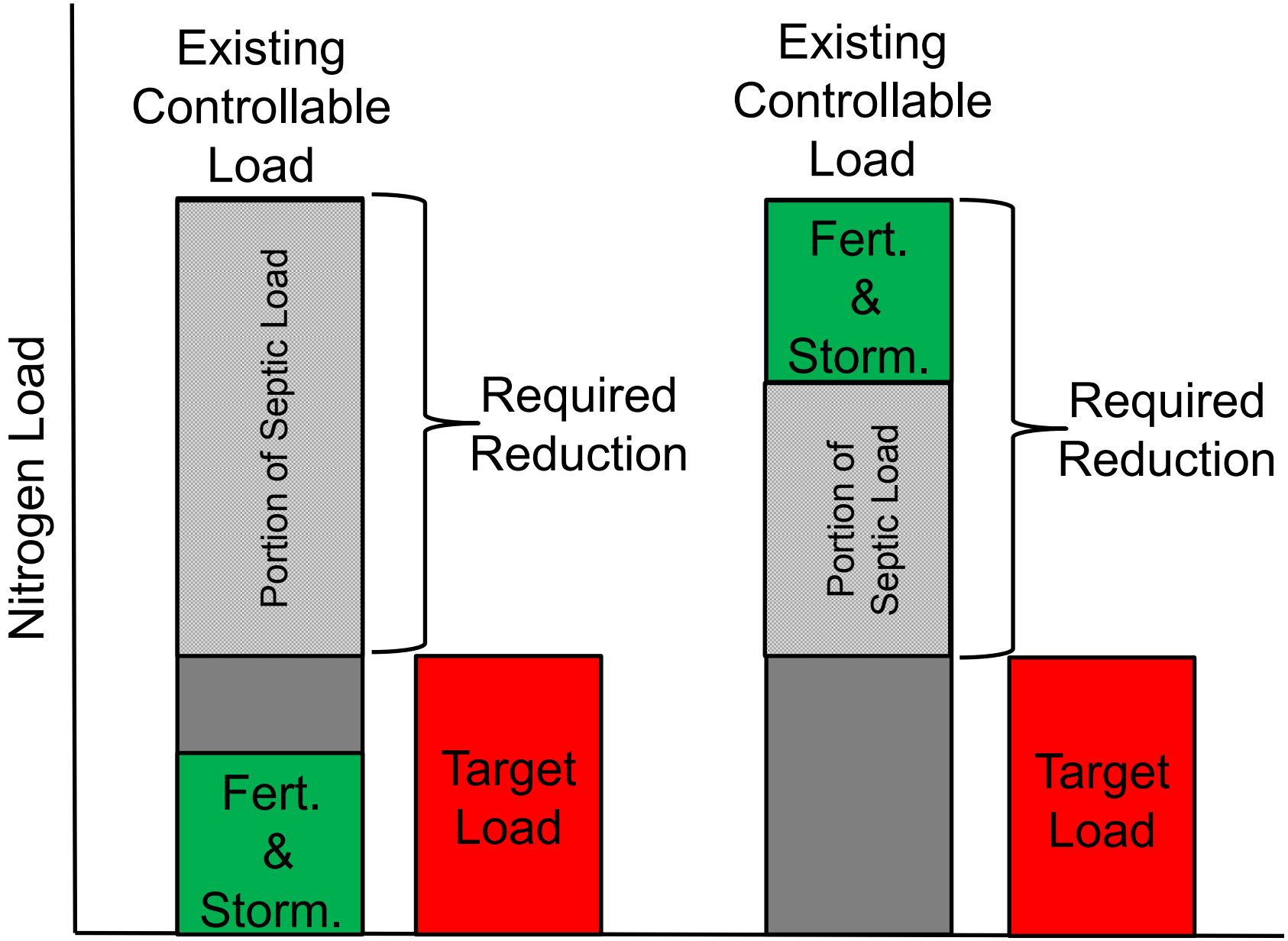

Problem Solving Approach
1
2
3
4
5
6
7
Wastewater
Existing Water Bodies
Regulatory
Targets/Reduction Goals
Present Load:
X kg/day
Target:
Y kg/day
Reduction Required:
N kg/day
Other Wastewater Management Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management
Low Barrier to Implementation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

"Waterhsed Working Group - Provincetown Harbor - Workshop 2"



"Waterhsed Working Group - Provincetown Harbor - 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
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A. Fertilizer Management
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B. I/A Technologies
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Title 5
IA
Priority Collection/High-Density Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
STEP/
STEG
Supplemental Sewering

Triple Bottom Line

Impacts of Technologies and Approaches

Environmental

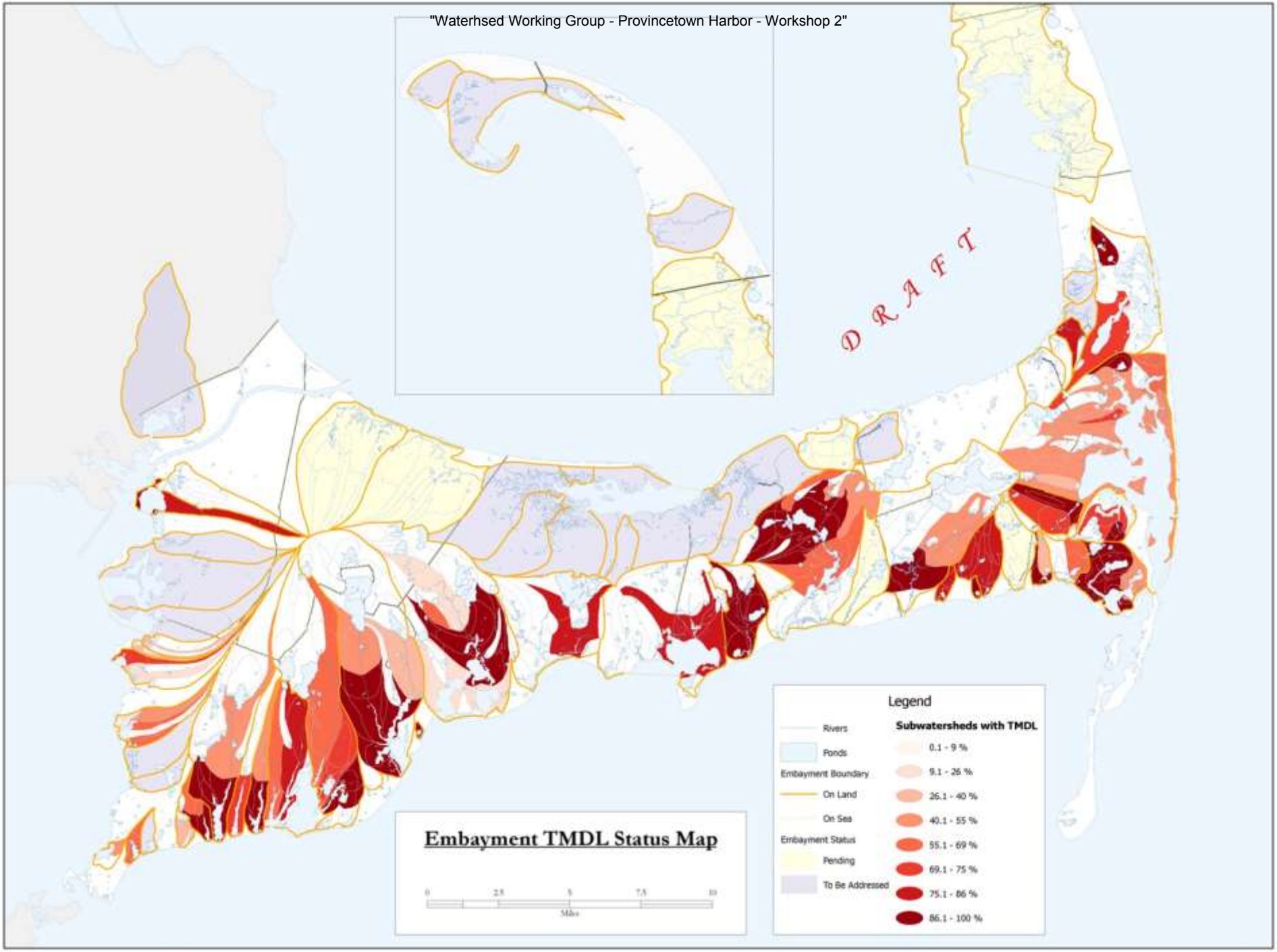
Economic

Social

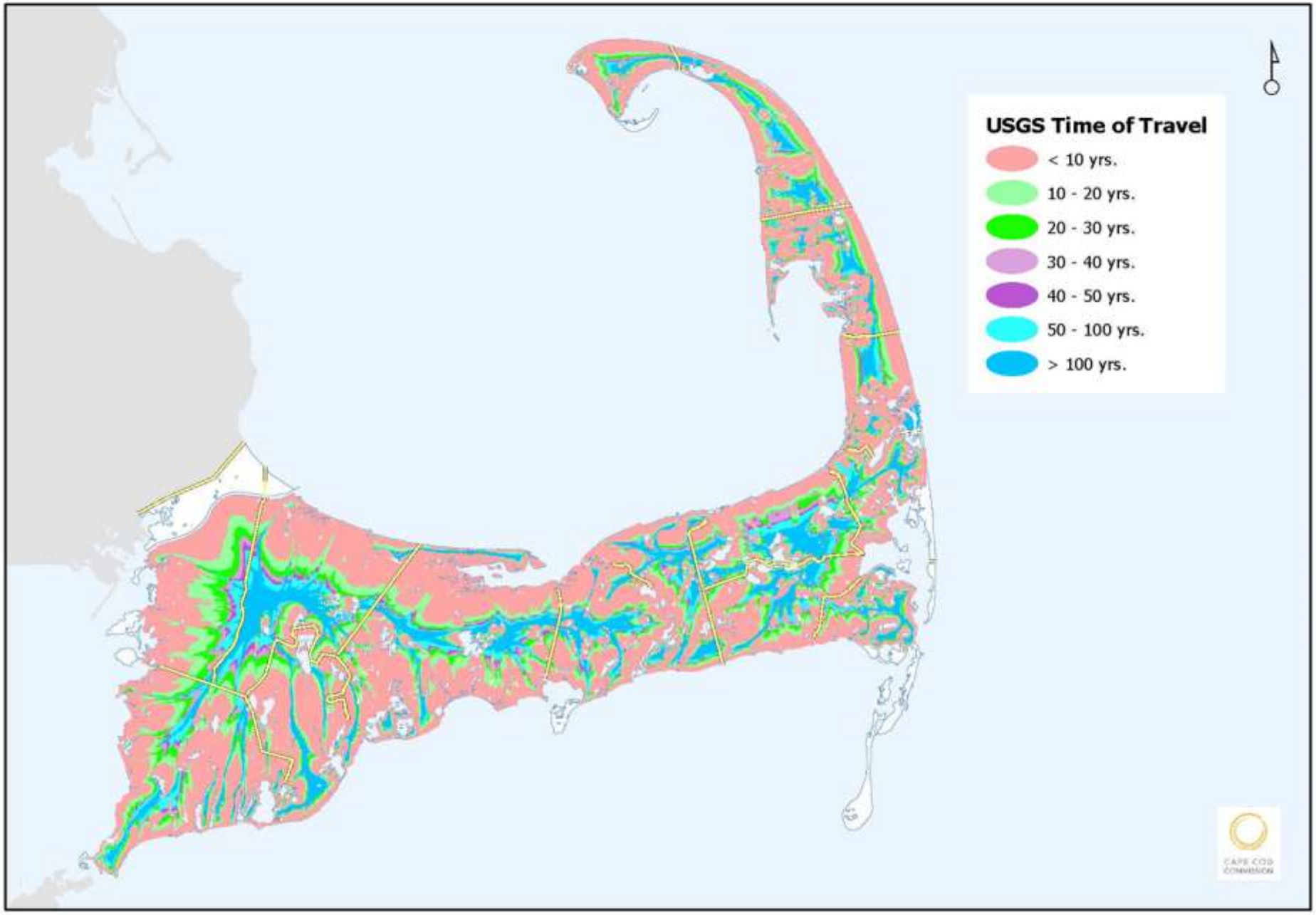
Technology Selection: Process and Principles

- 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

"Waterhsed Working Group - Provincetown Harbor - Workshop 2"



"Waterhsed Working Group - Provincetown Harbor - 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
Provincetown Harbor Working Group

Meeting Two
Thursday, October 31, 2013
8:30 am- 12:30 pm
Provincetown Town Hall

Meeting Summary Prepared by the Consensus Building Institute

I. ACTION ITEMS

Working Group

- Next meeting: Meeting Three
  Tuesday, December 3, 2013
  8:30AM -12:30PM
  Provincetown Town Hall, 260 Commercial Street, Provincetown, MA 02657
- Send Kate any additional comments on Meeting One Summary
- Continue to prepare thoughts about which technologies and approaches they would like to learn more about for application in the Provincetown Harbor watershed. Different scenarios and options will be discussed during Meeting Three

Consensus Building Institute

- Send link with presentation to participants
- 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
- Culvert needs to be replaced at East Harbor and Pilgrim Lake, add this to the Commission's list of plans
- Collect all studies and analyses that have been done for the Provincetown Harbor area

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

Ms. Erin Perry, special projects manager for the Cape Cod Commission (the 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

[1] The PowerPoint presentation is available at:
http://watersheds.capecodcommission.org/index.php/watersheds/outer-cape/provincetown-harbor

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, which are being held in October and early November, are focused on exploring technology options and approaches. The third meetings of the Watershed Working Groups will be held in December and will focus on evaluating watershed scenarios, which will be informed by Working Groups' discussions about baseline conditions, priority areas, and technology options and 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.[2] Once it is finalized by the Commission, the Technology Matrix will be shared with Working Group members.

Ms. Perry shared the progress made by the 208 Plan team since Meeting One, which includes:

- Meeting materials were distributed to stakeholders and made available online at: http://watersheds.capecodcommission.org
- GIS data layers were made accessible online at: http://watersheds.capecodcommission.org
- Chronologies are being updated and will be made available soon. Commission staff members have been tracking down the things that were mentioned during the previous meeting and are in the process of incorporating these points into the chronologies.

Ms. Perry invited participants to attend the Cape Cod-wide event on November 13, which will be held 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 how the Commission can continue to engage stakeholders after the third meeting in December.

Ms. Perry then reviewed the goal of this meeting, which is:

- 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. Kate Harvey, the facilitator from the Consensus Building Institute, reviewed the agenda and led introductions. A participant list is found in Appendix A. She also thanked participants who

[2] Technology Fact Sheets are available at: http://watersheds.capecodcommission.org/index.php/watersheds/outer-cape/provincetown-harbor

provided feedback on the chronology. She mentioned that, in light of the concern participants had at the last meeting about engaging the National Seashore, the Consensus Building Institute has reached out to them and National Parks Service representatives will be contributing input and attending some of the meetings. One participant added, in regards to the Seashore, that the Seashore is on the Herring Cove sewer and that they need to be involved in this process.

- Ms. Harvey responded that the Seashore does see itself as an important stakeholder, and they are committed to participating as much as they can given their budget and time limitations.

III. RANGE OF POSSIBLE SOLUTIONS

Mr. Scott Horsley, Area Manager for the Provincetown Harbor Watershed Working Group, led a discussion of the range of possible solutions.

Before he began, a participant asked for clarification on whether the goal of the Working Group is to agree on a viable technology that will then become mandated by law.

- Mr. Horsley explained that the Commission is not trying to get Working Groups to pick a particular technology. The Commission is trying to get the Working Groups' help in coming up with a couple of approaches that can be pursued in different places throughout the Cape. The Commission is very open minded about the technologies being considered.
- Additionally, Mr. Horsley reminded the Working Group that the goal is to consider pathogens as well as nitrogen and phosphorus. He said the group should to be mindful of drinking and surface water issues, since bathing and shellfish are affected by pathogens as well as nutrient-related problems.
- In response to concerns about how this process is going to lead into regulation, Mr. Horsley said the Commission going to develop a plan from this process. The plan is going to have alternatives that all 57 watersheds can consider. It will include a couple alternative approaches that emerge from these Working Group meetings; these approaches will reflect what the Working Groups think are most appropriate and acceptable for communities on the Cape. The plan produced through this 208 planning process will feed into local comprehensive plans, which will then have to be approved by the Department of Environmental Protection (DEP). There will not be one general plan or one recommended technology for the entire Cape. This process is designed to be targeted and to support locally appropriate planning. The Commission hopes that towns and communities throughout the Cape will learn from each other throughout the process.
- Ms. Perry added that one of the goals of this process is to create a more flexible approach that can be used for reviewing local plans.
- Mr. Horsley said that during the upcoming November 13 meeting there will be more emphasis on where this process is going.

Mr. Horsley encouraged Working Group participants to keep in mind the following points as they learn more about and consider the pros and cons of each of the technologies and approaches:

- The 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; and the Technology Matrix, which includes additional information on site requirements, construction, project costs, operation and maintenance costs, reference information, and regulatory comments.
    - Mr. Horsley said that the Commission is asking for ongoing input from stakeholders on the public acceptability of technology options and approaches. He asked participants to provide feedback on the public acceptability of these different options during this meeting. This is an importance consideration and the Commission values stakeholders' perspectives on this.
- Not all of the technologies and approaches discussed will be applicable to Cape Cod.
- Some technologies are so promising that they may merit demonstration and pilot projects.
- Certain technologies or approaches will be effective at preventing nutrients from entering water bodies. Others will be effective at reducing or remediating nutrients that are already in the groundwater or water bodies.
- Regulatory programs can address nutrient controls for both existing development and future development.
    - Mr. Horsley encouraged participants to think about how addressing future development will either make the problem better or worse.
- Meeting Three will embark on hands on problem solving in each watershed to meet target load reductions. This meeting, Meeting Two, is intended to explore the possible solutions, their pros and cons, and the public acceptability of these options.

Technologies and Approaches for Improving Water Quality

Mr. Horsley began by discussing technologies and approaches for improving water quality. He 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).

Innovative/Alternative (I/A) Title V System: Innovative/Alternative on-site nutrient reducing systems typically consist of standard septic system components augmented to remove more nutrients than a standard Title V system. I/A systems refer to a class of systems designed to be recirculating sand filter (RSF) equivalents by meeting the same treatment limits in a smaller footprint. These systems are expensive, costing somewhere around twice as much as a regular Title V system. Mr. Horsley explained that these systems are usually geared toward reducing nitrogen, and often require the use of a carbon source, such as wood chips, that allow for denitrofication.

- *Is Bioclear is an I/A system*? Mr. Horsley responded that it is a separate system but along the same lines as an I/A system.
- *How much maintenance do these systems require?* Mr. Horsley replied that, like everything on the Technology Matrix including Title V systems, these systems require a significant amount of maintenance. He said that I/A systems require more maintenance than Title V, noting that there are instances in which Title V systems haven't required any maintenance at all and some instances in which they have been an ongoing problem.
- *Lint from washing machines is a big problem in Title V systems, and that putting a filter on your washer can really help.*
- *What happens when you the wood chips in an I/A system break down?* Mr. Horsley said you have to replace wood chips in your system, but not every year. They need to be replaced on a scale more like every decade or two. Methane pumps, in contrast to wood chips, provide an ongoing input of carbon and don't need to be replaced. The downside of methane pumps is that they require electricity and can be unplugged or can fail.
- Mr. Horsley explained that there are 20 or so technologies within the I/A system category. He said people who are interested in this approach can learn more about it from Massachusetts DEP (http://www.mass.gov/eea/agencies/massdep/water/wastewater/septic-systems-title-5.html) or the Barnstable County Health (http://www.barnstablecountyhealth.org/ia-systems).
- Mr. Horsley asked participants whether there are any I/A systems in Provincetown. A couple participants indicated that there are Bioclear systems in the area.

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, MA).Mr. Horsley explained that in Europe, they take urine from urine-diverting toilets to an off-site facility and use it to manufacture fertilizer. It can also be used for fertilizer on-site.

- *A participant commented that people visiting a home with a urine diverting toilet won't know how to use the toilet, so some urine will likely go into the regular septic tank*. Mr.

Horsley said that is probably correct. This is not a problem, it just decreases the effectiveness of this system at removing nitrogen

- Mr. Horsley said that Falmouth has a test program that is offering $5000 to home owners to try this technology

Composting Toilets: Composting toilet systems separate human waste from shower, sink, and other household water uses. Composting toilets use minimal water or no water. The human waste captured by composting toilets is decomposed and turned into compost. The compost generated through these systems is removed from the site; nutrients in the compost 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. Other household wastewater (such as from sink and shower uses) continues to flow into the septic system. (Example case: Falmouth, MA).

- *One participant said that the costs of things like composting toilets is going to be a key deterring factor for much of the public.* Mr. Horsley said that the cost of a composting toilet retrofit is about $5000 to $10,000. This approach might be a cost effective way for people, such as those in Provincetown, who can't get on sewer but want to.
- *Participants asked whether Provincetown officials can require that people who can't hook into sewer put in composting toilets?* Mr. Horsley replied that this shouldn't be required, but that the town could give people the option of putting in a composting toilet.
- *Participants noted that dry toilets and composting toilets are allowed in Massachusetts and that rain gardens are required by the Conservation Commission.*

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).

Participants were asked for questions and comments on these site level technologies and approaches.

- *A participant said that nitrogen is a natural nutrient; therefore she wants to know what the natural level of this nutrient is in the environment and why it is a concern.* Mr. Horsley explained that when there is too much nitrogen in water systems, it drives

problematic biological processes, such as algal blooms and loss of eel grass. We don't know to what extent nitrogen is a problem here in Provincetown, since there is no completed Massachusetts Estuaries Project (MEP) study for this area. It is possible that the nitrogen issue may not be as significant in the Provincetown area as it is throughout the rest of the Cape due to tidal floods. In light of this, the Provincetown Harbor Working Group may want to focus on other water quality issues.

- *A participant asked whether treating the ponds, such as with herbicide, is being considered as an approach*. Mr. Horsley said the goal is to prevent the problem, not just treat the symptoms.

- *A participant asked why there is no mention of pharmaceuticals and whether they can be removed from water systems*. Mr. Horsley said that the Commission is talking about the pharmaceutical and emerging contaminant issue. He said that a group called Silent Spring did a study on emerging contaminants and found that they are in water systems. However, studies on the impacts of the emerging contaminants haven't been done and we don't know what the effects of these chemicals are. Mr. Horsley acknowledged that there is the question of whether, as the Cape is addressing other water quality issues, we should think about addressing these emerging contaminants. He said the natural and biological technologies and approaches being discuss in this meeting appear to be the best way for removing these kinds of chemicals.

- *One participant said that some of the technologies being discussed involve waste removal by trucks, which is an involved process requiring trucks, people, and other infrastructure. The challenges associated with this should be considered.*

- *A participant said that people often don't do what they're supposed to. For example, they throw out plastic bottles rather than recycling them. He asked how we can get people to respond rather than react and to implement approaches that require individual compliance*. Mr. Horsley replied that behavior change can take 10 to 30 years, and that a significant public education campaign is needed. He said the Cape needs to be thinking decades ahead and be realistic that this process won't just involve one meeting, but will be ongoing. *The participant replied that he thinks approaches that involve the least amount of voluntary action or individual choices are likely to be most successful.*

- Mr. Horsley said the Cape needs to be thinking about climate change and sea level rise. He said that, due to these environmental changes, existing systems that are in compliance with Title V could fall out of compliance. This may make some of these new technologies and approaches look more appealing and more acceptable to 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. In most areas, the collection system is the most expensive part of wastewater treatment systems because houses are so far apart. Provincetown is an exception to this.

- *One participant said these cluster systems take up a lot of space. He asked how much space they realistically require.* Mr. Horsley replied that the drain field is the main use of space and that the collection system itself isn't that large.

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). Mr. Horsley explained that eco machines can be used to make fertilizer. So, instead of buying fertilizer from off the Cape, this process can be used to create fertilizer on the Cape. He added that these machines can be used at a variety of scales (e.g., at the municipal scale as well as the neighborhood scale).

- *How much wastewater this system can process?* Mr. Horsley said these systems can process a lot of water and can be scaled up. For example, in Hawaii, this technology is used a lot. He noted that in New England, this process would require greenhouses.
- *Does this system remove viruses and pharmaceuticals?* Mr. Horsley said there is not a lot of research on this, but that this might be an effective approach for removing viruses and pharmaceuticals.

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. Also look at Alewife in Cambridge, MA). Mr. Horsley asked participants to explain how the stormwater wetland on Commercial Street in Provincetown is working.

- *One participant said that, historically, the town had 20 or so beach closures in the area. This summer there were none, which they think was in part due to the stormwater wetland.* Mr. Horsley asked what this project cost. *A participant said the completed section cost about $1.8 million and that the plan is to eventually do this throughout the town.* Mr. Horsley asked whether there have been any maintenance problems or

degradation. *Participants replied that there hasn't really been any major maintenance or issues thus far.*

- *Is this technology something that could be applied to individual driveways?* Mr. Horsley and other participants said the maintenance of this would probably be an issue and that this kind of approach makes more sense for something like a shopping mall or larger.

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 10 mg/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 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. (Example case: Albany, OR).

- *A participant said he ran into planning problems while doing a constructed wetland project in Brewster. He said he is concerned about people getting caught between towns and Commission and asked to what extent the 208 Plan will be coordinated with the towns.* Mr. Horsley said that the towns should look to the 208 Plan as a guidance document; it will be an official plan that is adopted by the county and approved by the state and the Environmental Protection Agency (EPA). Ms. Harvey said the stakeholder process is designed to get the towns on board and to support coordination between the towns and the Commission. Ms. Perry added that the towns have had a lot of input throughout the process.
- *A participant said this "communication breakdown" point is important, and that if the Commission is going to implement a plan, communication has got to be loud and clear.*
- Mr. Horsley said that private developers sometimes want to do something innovative, but steer clear of doing it because it is too hard to get it permitted and accepted. The goal of this planning process is to make using innovative technology easier and to streamline permitting.
- *A participant commented that the Fact Sheet says the constructed wetland—surface flow approach hasn't been approved.* Mr. Horsley said that this technology has been routinely approved by the Massachusetts DEP, and there is a lot of evidence to indicate that it works.
- *Does this approach refer to existing as well as created wetlands?* Mr. Horsley replied that the wetlands used for this treatment are constructed, typically upstream of

natural wetlands. The goal is to protect existing wetlands, not to overload them with wastewater. That said, he added, the MEP process gives credit for water that moves through existing wetlands.

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 to 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). Mr. Horsley said that data show these systems are even more effective than surface wetlands. This is a very powerful treatment system.

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.

- *One participant commented that Provincetown's leach fields are soccer fields.*
- Mr. Horsley noted that one concern is keeping the water balance within the hydrologic system. You can deplete the water table if you inject water into deeper aquifer.

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.

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).There is currently a proposed phytoirrigation project in Sandwich that would be run through rhododendrons. This project is in design phase.

Participants were asked for questions and comments on these watershed level technologies and approaches.

- *To what extent cost will be incorporated into the planning process?* Mr. Horsley said that cost will be added to matrix, along with other indicators, such as maintenance requirements.
- *To what extent is the 208 Process going to deal with financial limitations?* Mr. Horsley said this will be discussed more later in the presentation. He encouraged participants

to think about co-benefits of approaches. For example, if you use oyster reefs, the cost of implementation may be offset by the benefits this approach can provide. The Technology Matrix will incorporate a lot of this information.

- *What is the longevity of the approaches being considered? Are there things that can extend the lifecycle of these options (e.g., introducing beneficial insects) are being considered?* Mr. Horsley said the Commission is going to analyze technologies and approaches on a lifecycle basis and that longevity will be considered.
- *Has anyone has thought about reusing treated wastewater? Centralized tanks could be used to capture reuse water for fertilizer irrigation. In other areas of the country, he said, it is common practice for golf courses to use treated wastewater. This kind of "co-benefits" thinking is what the Cape needs to be doing.*
- *Water needs to be carefully tested before we put it on land, since it can kill crops, grass, and potentially wildlife if there are high concentrations of certain things (such as pharmaceuticals or other chemicals) in the water.*

Neighborhood or watershed level technologies/approaches

Phytobuffers: This approach involves using trees with deep root systems, particularly willows and poplars, to capture nutrients in the soil. Green plants with deep taproots 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). Mr. Horsley said that wastewater treatment plants don't remove all nutrients. Fertigation can be used to remove more nutrients from treated wastewater.

- *A participant commented that there is only sandy soil in this area and asked whether this will work for fertigation.* Mr. Horsley said yes, sand is a good filter. He said you need 50 feet of sand to remove bacteria, and more like 200 feet to remove viruses.

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). Mr. Horsley said a PRB has been installed in Waquoit Bay and has been successful in removing nitrogen.

- *One participant mentioned that it takes seven years for nitrogen to travel from the Provincetown leach field to Cape Cod Bay*.

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 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 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 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, which would provide 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: Surface water remediation wetlands can be 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).

- *A participant noted that the byproduct of dredging could be valuable and asked whether there are restrictions on what can be done with this sediment*. Mr. Horsley said that yes, there are restrictions on what can be done with this sediment and that is a big part of why dredging has such a lengthy permitting process. When dredging, you have to do extensive testing. Often there are a lot of toxins in this material. Depending on what is in the soil, it can be used for different purposes. If it is contaminated, it often has to be disposed of, which is expensive. This testing is time consuming and expensive.

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". Mr. Horsley noted that the Provincetown sewer system is affordable due to development not being so spread out.

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 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 they sell their development rights, the protected parcels in the sending 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.

- *Is it is possible to do TDR across town boundaries?* Mr. Horsley replied that doing so would require a legal change, but it is something that we can and should consider. You can't do it today under current regulations, but it is possible to change the rules on this. Also, we don't have to create anything new in undertaking TDR—this is something other places have done and created a good template for.
- *In Provincetown there is a "checkerboard" system for sewer. There are a lot of properties that want to sign up, but it isn't always cost effective to hook these properties up to the sewer. What could be done for these properties?* Mr. Horsley said that a shared Title V system is one option for these properties.
- *Is having developers be required to put funding into a "sewer fund" or something like that is a possibility for generating funds?* Mr. Horsley said that it would be possible to trade development rights (e.g., increase density) in exchange for payment for infrastructure costs.
    - *Another participant said that economic development is one way to do this. Also, he mentioned that stakeholders in the towns have changed over time. For example, one hotel didn't want to be on sewer until the owners wanted to sell and then they "attended every meeting" and really wanted to get put on sewer.*

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.

Existing efforts on the Cape

Mr. Horsley noted that many towns on the Cape are already using some of these technology

options and approaches. He 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: 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

IV. PROBLEM SOLVING PROCESS AND PRINCIPLES

Mr. Horsley provided an overview of the problem solving process and principles. He reiterated that the 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). He noted that Provincetown has already sewered and thus is in a slightly different position than many other Cape communities.

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 total maximum daily loads (TMDLs) change depending on the characteristics of the watershed.

Overview of 7-steps for Problem-Solving Process

Mr. Horsley described the 7-step alternatives screening process the group will apply. The process is as follows:

1) Targets/Reduction Goals: Establish targets and articulate project goals. Mr. Horsley noted that some study areas have MEP reports that tell them what the TMDL targets have to be. In Provincetown and a couple areas, we don't have MEP studies, so we have to figure out what our targets and goals are going to be.
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 have low barriers to implementation and 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).

- *One participant indicated the East Harbor area needs to be targeted, Mr. Horsley agreed*.

4) Watershed/Embayment Options: Assess alternative options to implement at the watershed or embayment scale (e.g. innovative and lower-cost solutions).
    - *A participant said that there was a recent meeting about East Harbor and Pilgrim Lake, and that they know they need to at least replace the culvert. This should be added to the Commission's list of plans.*
5) Alternative On-Site Options: Assess options to implement at the site-level.
6) Priority Collection/High Density Areas: Examine priority collection/high density areas.
7) Supplemental Sewering: Consider traditional sewering or other grey infrastructure management options.

Ms. Harvey asked the Working Group to reflect on the goals and priorities of this process.

- *One participant commented that there is a presumption that Provincetown knows what its goals are as a town. If the goal is clear, then the challenge is to figure out how to get people to do what needs to be done, such as through incentivizing them to do things that will improve water quality.*

Mr. Horsley asked the group to articulate what they think the goals of the 208 planning process are for this area. Goals and priority concerns expressed by participants include:

- *Improve our environment*
- *Address nutrients in ponds*
- *Prevent beach closures*
- *Get more people hooked up to our sewer*
- *Stormwater continues to be a problem*. This is more of a pathogen concern than a nutrient concern, according to participants.
- *Beach Point is a priority*, this is a problem area. There were Title V problems at Beach Point associated with the condo complex and have been some beach closures due to contamination. Also, the bunkered systems in the area have affected aesthetics and property values.
- *Technical analyses and studies needed*. The MEP has done a study on Provincetown and Truro. This was not a technical analysis, but it does have some information that can help Provincetown figure out its goals. The town does have a good idea of what the problems are.
- *Parking and other impermeable surfaces are an issue*. Currently, the requirements are 1.5 parking spaces for unit. The pavement used for parking is impermeable, which creates runoff. You can't manage that kind of runoff with vegetation (it's too much). At some point in the past, the town was talking about putting scrubbers in storm drains in Provincetown.
- *Provincetown could become an eco-destination resort town.* Provincetown could become a demonstration community for sustainability and stormwater solutions. Mr. Horsley said there has been talk about making the Cape an environmental laboratory.

Provincetown could be a demonstration site for innovative water quality technologies. This could bring in money and be a source of economic development.

Ms. Harvey asked the group whether any of the technologies discussed are of particular interest to people in the Working Group.

- *Many participants expressed interest in the ecological solutions, such as phytobuffers and on-site vegetative solutions.*
- *One participant said that wood chips seem like a simple solution to the problem.*
- *A participant said stormwater is a particular concern. The town has talked about treating stormwater for biological contaminants, but currently doesn't*. Mr. Horsley said that permeable pavement will help with this.
- *One participant mentioned that the Cape brings in food from outside, and the nutrients from this food ultimately get deposited here. Therefore, she said, there is a nutrient imbalance that should be considered*.
- *One participant thinks that the urine diversion toilets are unlikely to be acceptable and realistic on the Cape. He's concerned about the infrastructure that would be involved in this*. Mr. Horsley replied that urinals in public bathrooms would be an easy way to try this approach. Perhaps Provincetown could put urine diverting urinals in new public restrooms, with signage about these toilets that indicate they are part of a larger eco-destination approach. *You would have to have a place to put in the tank, which could be challenging given the location of public restrooms. Also, finding locations for the restrooms themselves is challenging. Participants said this approach is likely to get pushback from the public.*
- *A participant suggested that one of the byproducts of this 208 planning process could be to create a guide for restaurants and businesses to give them tools and guidelines for implementing these kinds of innovative technologies. Good guidelines could help businesses make good investments that could be environmentally beneficial and cost-effective.*
- *One participant pointed out that people have complained about paying for water twice—one through their water bill and once through their sewer bill. The combined cost of sewer is somewhere around $800; the Commission has updated costs for this. Reducing wastewater could be cost-effective for people and businesses.*
- *A participant said that if the town is going to try something or pilot something, it has to have a good reasons for what it is doing and why*. Mr. Horsley suggested the town could meter urinals at the main public restaurants or restrooms, and get a sense of how much nitrogen could be diverted, and then this could be translated into effectiveness and cost savings.

Ms. Harvey asked whether there are any technologies or concerns that are particularly of interest to Truro.

- *A participant suggested that composting toilets and dry toilets are likely to be a hard sell in Truro. Installing these might decrease property value and they also won't fix Title*

V problems where they exist.

- *Another indicated that the big problem for the area is stormwater*.
- *A participant added that at Beach Point, they didn't size the pipe properly to address future water needs due to cost and legal issues.*

Ms. Harvey summarized the main priorities and concerns that participants thought should be considered in choosing approaches, according to the categories of Environmental, Economic, and Social concerns:

Environmental

- Climate change impacts
- Impact on ponds
- Co-benefits for the environment (e.g., habitat)
- Addressing contaminants of emerging concern

Economic

- Co-benefits and return economic benefits (e.g., cost savings and business development)
- Cost of implementation and maintenance
- Longevity of systems
- Effect on property values

Social

- Options with less homeowner involvement
- Things that are more easy to get public buy-in for
- Space requirements: things that take up less space are better
- Making the area a eco-resort destination and demonstration community
- Cost-effectiveness and co-benefits of approaches

Ms. Harvey summarized the technologies and approaches that participants expressed particular interest in:

Technologies and approaches of particular interest

- Composting toilets for public restrooms
- Ecological and vegetative solutions
- TDRs
- Woodchips as carbon additions to I/A systems
- Stormwater controls
- Aquaculture

Ms. Harvey then summarized the goals participants expressed during the meeting.

Goals for the 208 planning process

- Conduct studies and get a sense of the sources and extent of water quality issues

- Meet Title V requirements in areas where there isn't sewer
- Maintain bathing beach water quality
- Address stormwater runoff issues, particularly pathogen problems
- Address nutrient problems in ponds
- Deal with overuse of standard systems
- Increase the capacity of the Beach Point system or otherwise address this problem area

V. PLANNING FOR THE NEXT MEETING

Ms. Harvey gave an overview of the next meeting, Meeting Three. She said that scenarios will be formed using the input that was generated today and during the first meeting. At the next meeting, the group will be able to discuss these scenarios, evaluate them, and think about alternative tools and approaches.

Meeting Three will be held:
Tuesday, December 3, 2013
8:30AM -12:30PM
Provincetown Town Hall, 260 Commercial Street, Provincetown, MA 02657

Working Group participants should come the Meeting Three 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.

Mr. Horsley encouraged participants to come to the November 13 meting for all stakeholders from all eleven working groups. This meeting will be a chance to think about and identify ways for the Commission to continue to engage stakeholders after the third meeting in December.

VI. GENERAL QUESTIONS AND COMMENTS

Ms. Harvey asked for any final questions or comments.

- *A participant suggested that treatment and sludge removal should be looked at as part of any studies or analysis that are done*.
- *A participant commented that, due to fertilizer regulations, fertilizer is going to be required to not have phosphorus in it. Getting rid of phosphorus in fertilizer will have significant benefits for ponds in the area. Golf courses support these fertilizer regulations. Additionally, the participant said, about $80,000 have been set aside for public education and engagement to make sure people understand the regulations and how to lower phosphorus and nitrogen use.*

Ms. Harvey asked whether any participants have tried using or looking at the GIS layers put online by the Commission.

- *One participant said she gave it a cursory look and thought the data was very impressive.*

APPENDIX ONE: MEETING PARTICIPANTS

Appendix A
Attendance

Name	Affiliation
Elaine Anderson	Provincetown Board of Selectmen
Brian Carlson	Conservation Agent, Provincetown
Laurie Demolino	Board of Health, Provincetown
Paul DeRuyter	Whaler's Wharf
Charleen Greenhalgh	Town Planner, Truro
Jerry Irmer	Provincetown Harbor Committee
Gloria McPherson	Planner, Provincetown
Sharon Lynn	Town Manager, Provincetown
Laura Kelly	Owner, Littlefield Landscapes, North Eastham
Pat Pajaron	Health Agent, Truro
Jonathan Sinaiko	Water and Sewer Board Chairman
Staff and Consultants	
Scott Horsely	Area Manager, Cape Cod Commission
Erin Perry	Special Projects Coordinator, Cape Cod Commission
Anne McGuire	Cape Cod Commission
Kate Harvey	Facilitator, Consensus Building Institute
Danya Rumore	Facilitator, Consensus Building Institute
Dan Milz	PhD Candidate, University of Chicago
Public	
Ed Nash	Golf Course Superintendents of Cape Cod