Integrated Planning for Nitrogen Controls in the Exeter/Squamscott Watershed—New Flexibility Brings New Opportunities

NEWEA 2016 Annual Conference & Exhibit
January 24–27 | Boston Marriott Copley Place | Boston, MA

Water Integration for Squamscott-Exeter (WISE)

WISE PROJECT TEAM

Geosyntec consultants

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University of New Hampshire

Alison Watts, Watershed Science Lead

Rockingham Planning Commission

Cliff Sinnott and Theresa Walker, Intended User Representatives

cbi Consensus Building Institute

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National Estuarine Research Reserve System

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Town of Exeter Founded 1638 New Hampshire

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Lincoln Daley, Town Planner

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United States Environmental Protection Agency

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National Estuarine Research Reserve System Science Collaborative

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Kalle Matso, Program Manager

NHDES

Ted Diers, Matt Wood, Phil Trowbridge, Barbara MacMillan, Sally Soule, Eric Williams

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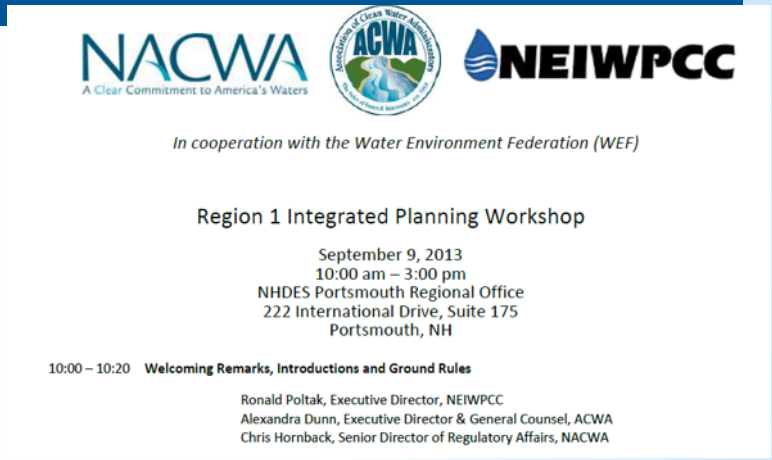
We would like to thank these people for their important contributions to the project. Many busy people have invested substantial hours discussing this project. We appreciate your time and effort.

- Pete Richardson
- Ed Leonard
- Nathan Merrill
- Doug Scamman
- Kirk Scamman
- Brandon Smith
- Cory Riley
- Steve Miller
- Kalle Matso
- Richard Langan
- Steve Jones
- Michelle Daley
- Pete Richardson
- Sylvia VonAulock
- Kristen Murphy
- Phyllis Duffy
- Dean Peschel
- Eric Strecker
- Adrienne Nemura
- Marcus Quigley
- Bill Arcieri
- David Cedarholm

WHY INTEGRATED PLANNING?

- **Integrated Planning allows for crediting across the MS4 and WWTF permits which can have important economic benefits**
- **Integrated Planning allows a flexibility in implementation to plan for most cost effective measures first while still meeting regulatory standards that protect public health and water quality**
- **Encourages the use of green infrastructure which manages stormwater as a resource, and supports other economic benefits and quality of life.**



NACWA A Clear Commitment to America's Waters · ACWA · NEIWPCC

In cooperation with the Water Environment Federation (WEF)

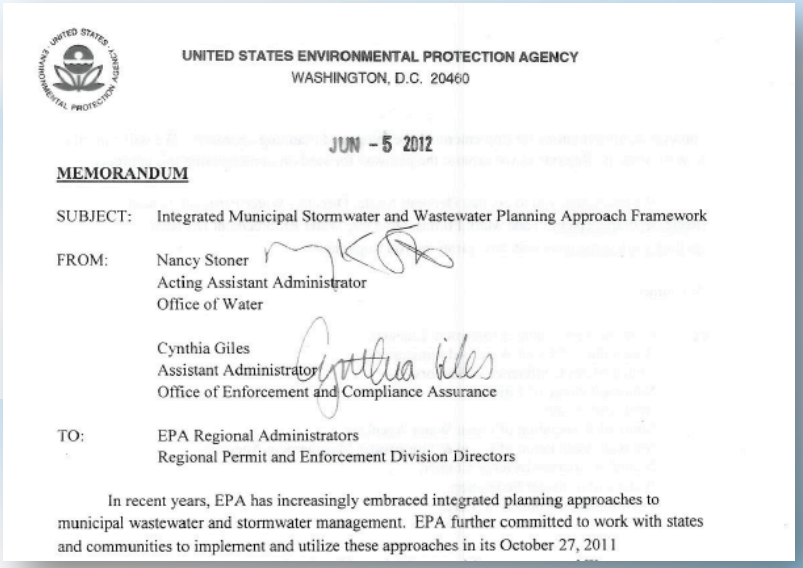
Region 1 Integrated Planning Workshop

September 9, 2013
10:00 am – 3:00 pm
NHDES Portsmouth Regional Office
222 International Drive, Suite 175
Portsmouth, NH

10:00 – 10:20 **Welcoming Remarks, Introductions and Ground Rules**

Ronald Poltak, Executive Director, NEIWPCC
Alexandra Dunn, Executive Director & General Counsel, ACWA
Chris Hornback, Senior Director of Regulatory Affairs, NACWA

Region 1 has challenged the Great Bay communities to develop the first in the nation IP for MS4 and WW (EPA, 2013)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN - 5 2012

MEMORANDUM

SUBJECT: Integrated Municipal Stormwater and Wastewater Planning Approach Framework

FROM: Nancy Stoner
Acting Assistant Administrator
Office of Water

Cynthia Giles
Assistant Administrator
Office of Enforcement and Compliance Assurance

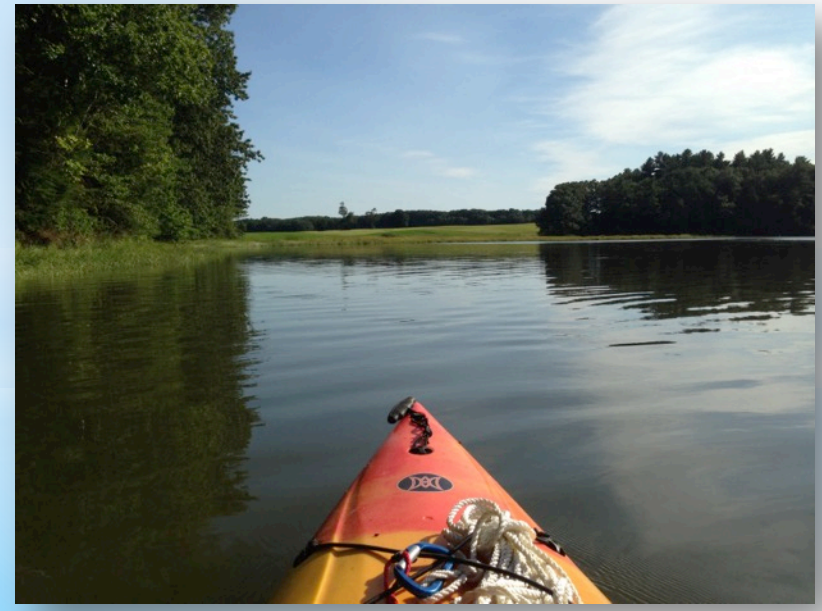
TO: EPA Regional Administrators
Regional Permit and Enforcement Division Directors

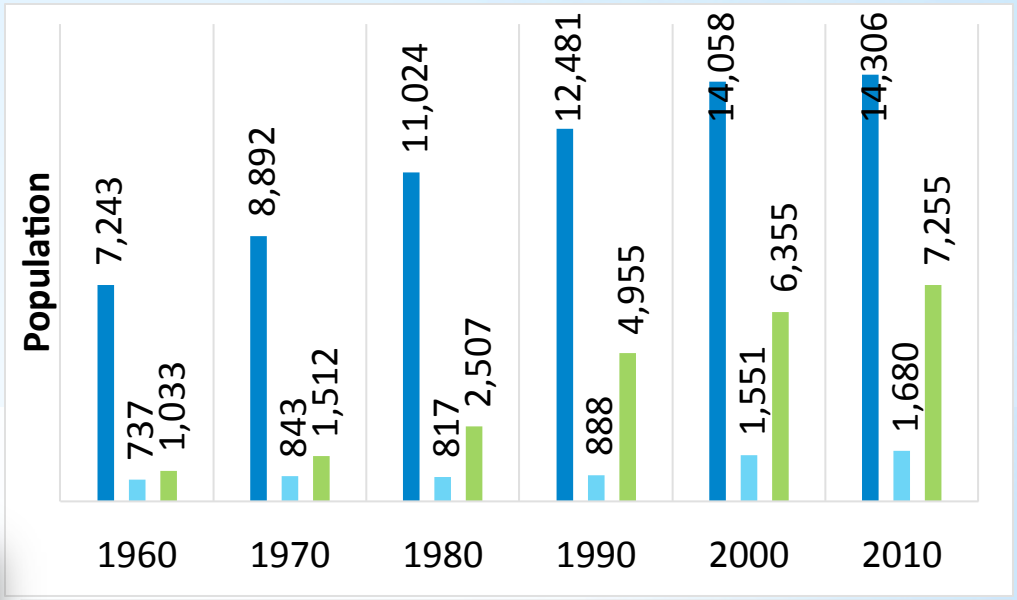
In recent years, EPA has increasingly embraced integrated planning approaches to municipal wastewater and stormwater management. EPA further committed to work with states and communities to implement and utilize these approaches in its October 27, 2011

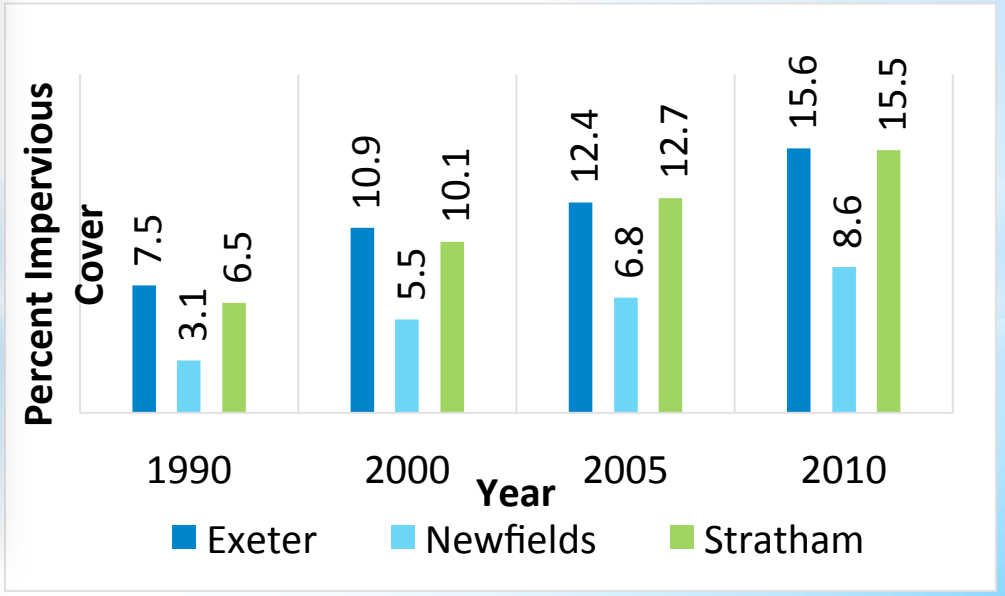
Integrated Municipal Stormwater and Wastewater Planning Approach Framework (EPA, 2012)

POPULATION GROWTH & DEVELOPMENT

- 198-702% population increase in 50 yrs
- ~200% increase in impervious surface in 20 yrs







CHALLENGES & OPPORTUNITIES

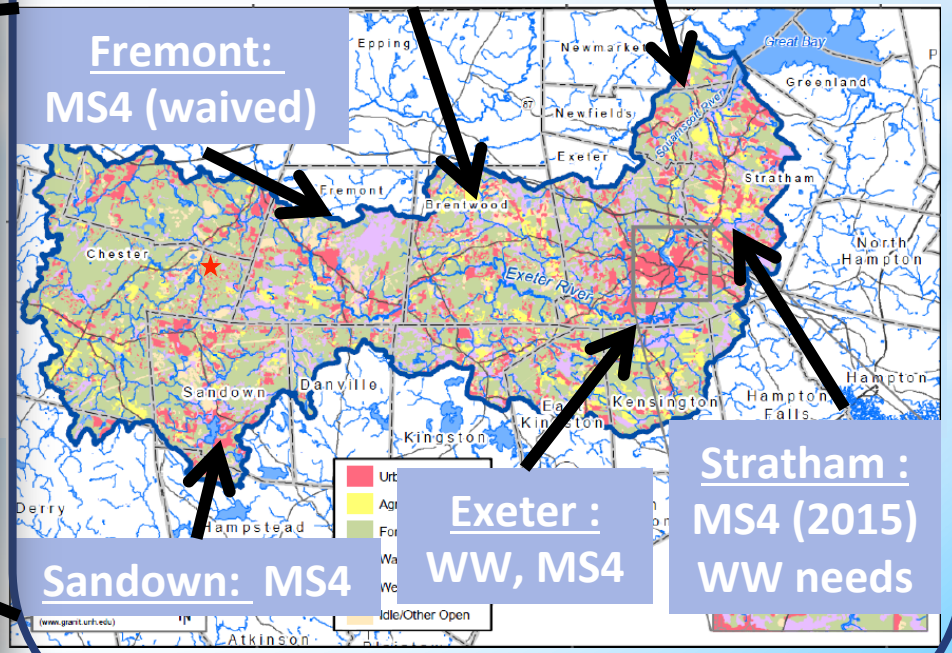
Coastal NH, ME, MA

Exeter & Squamscott River Watershed

Brentwood: MS4 (waived)

Newfields: WW, MS4 (waived)

Fremont: MS4 (waived)



Exeter : WW, MS4

Stratham : MS4 (2015) WW needs

Sandown: MS4

THE WISE PROJECT PLAN

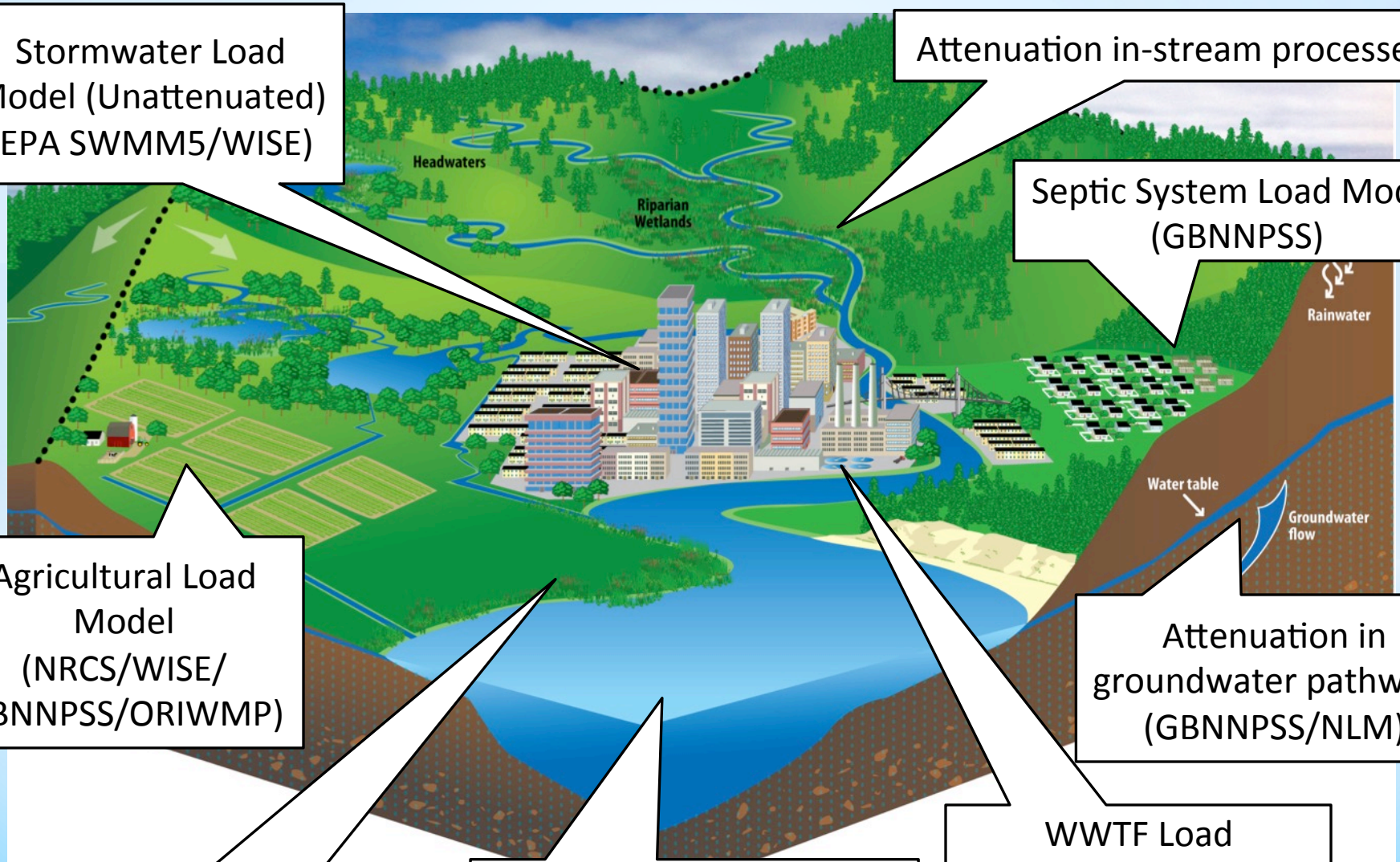
Integrated Plan for Watershed

- ☑ Community Specific Actions
- ☑ Costs & Benefits
- ☑ Adaptive Management and Flexible Scheduling

COLLABORATION

EPA, NH DES, Communities of Exeter, Newfields, Stratham, Geosyntec, UNH, NERRS, Rockingham Planning Commission, Consensus Building Institute

POLLUTANT LOAD ANALYSIS COMPONENTS



Stormwater Load Model (Unattenuated) (EPA SWMM5/WISE)

Attenuation in-stream processes

Septic System Load Model (GBNNPSS)

Agricultural Load Model (NRCS/WISE/ GBNNPSS/ORIWMP)

Attenuation in groundwater pathways (GBNNPSS/NLM)

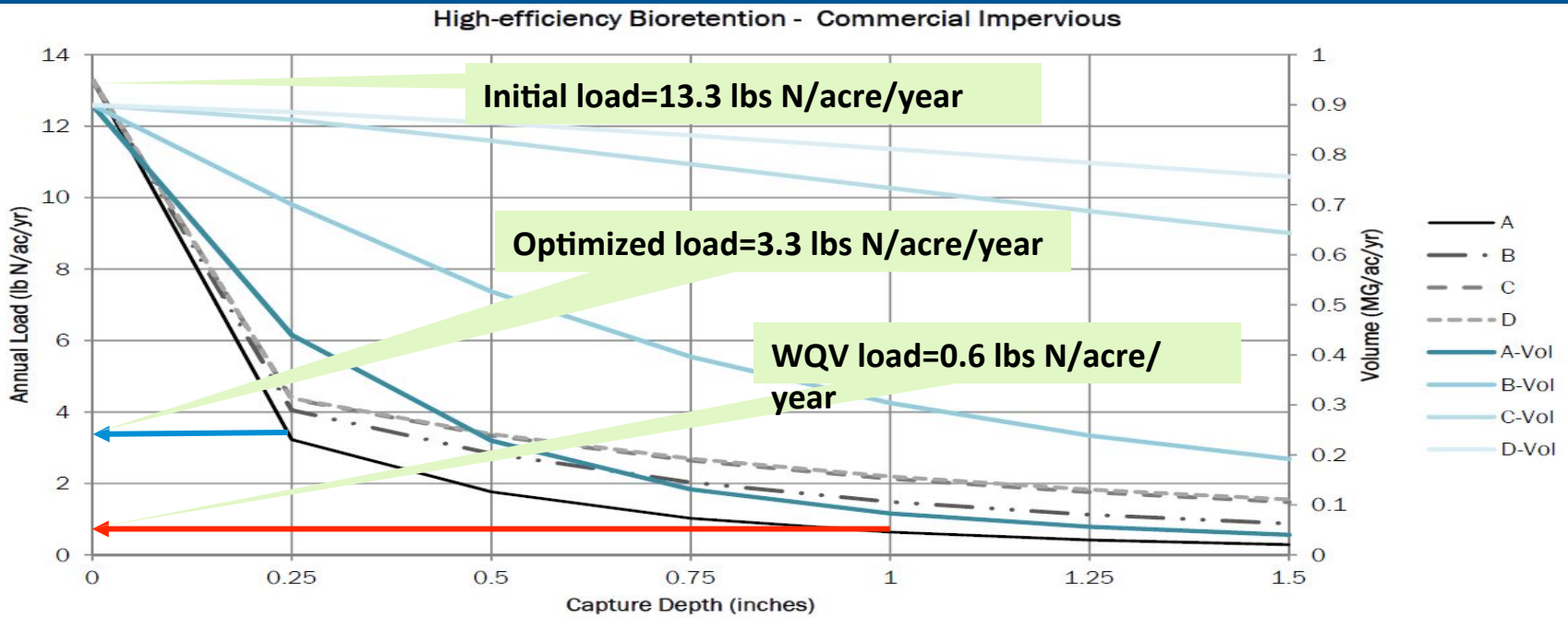
Attenuation in buffer zones

Attenuated Load To Estuary (GBNNPSS/NLM)

WWTF Load (Exeter/Wright Pierce)

Source: Michigan Seagrant

BMP OPTIMIZATION

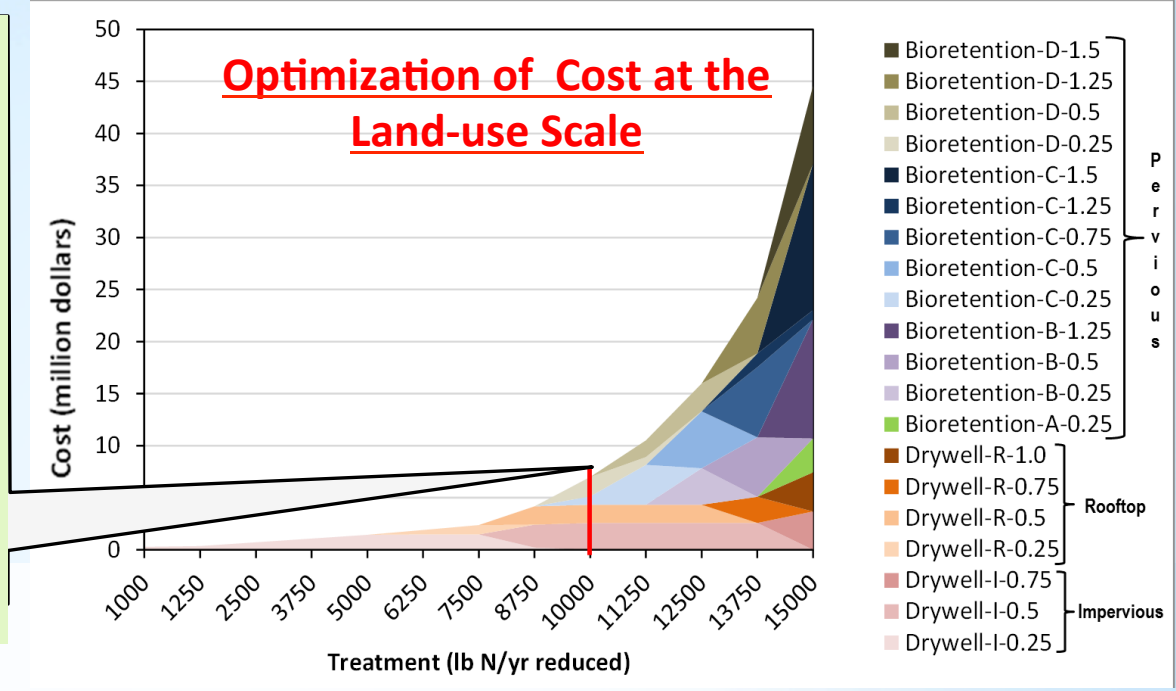


BMP Sizing Example:

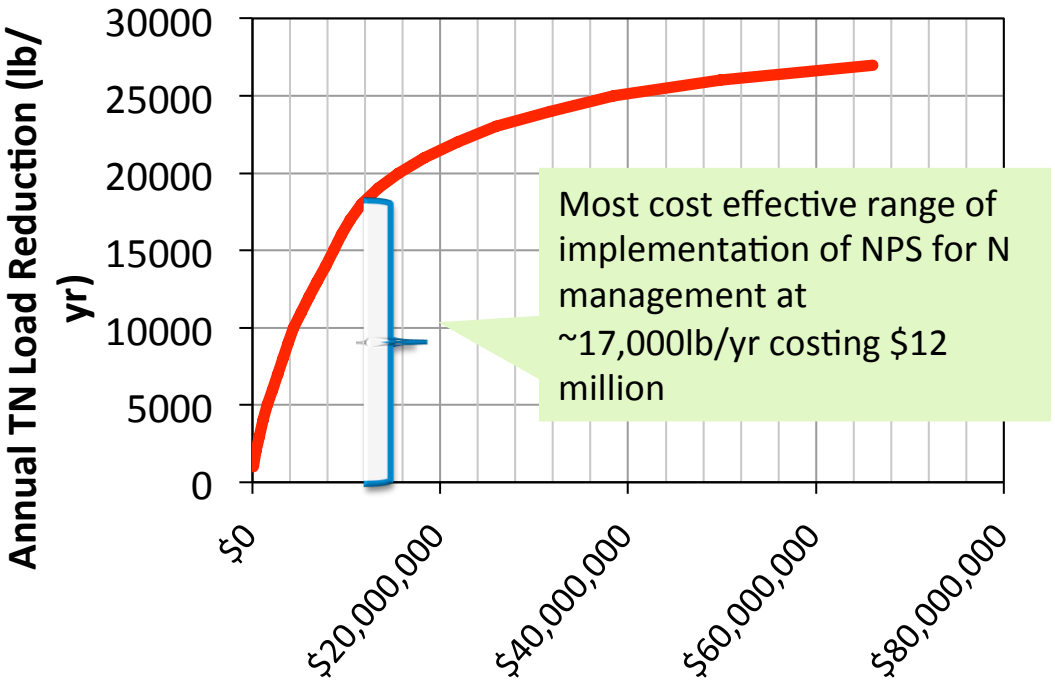
- 1 system treating a 1” water quality volume for 1 acre will remove approximately 12.7 lbs N/acre/year.
- 4 smaller systems across 4 acres designed to treat 0.25” WQV/acre/yr will each remove 10 lbs N/acre/year for a total of 40 lbs N per year.
- An additional 27 lbs of nitrogen per year at nearly equivalent costs, or approximately 315% increase.

To achieve **10,000 lbs** of reduction by treating residential land, use a mix of:

- Drywell/Infiltration trenches, 0.5” capture depth, treating runoff from driveways/ sidewalks
- Drywells, 0.5” capture depth, treating roof runoff
- Bioretention (rain gardens), 0.25” capture depth, treating runoff from pervious C soils
- Bioretention (rain gardens), 0.25” capture depth, treating runoff from pervious D soils



Optimization of Cost at the Watershed Scale

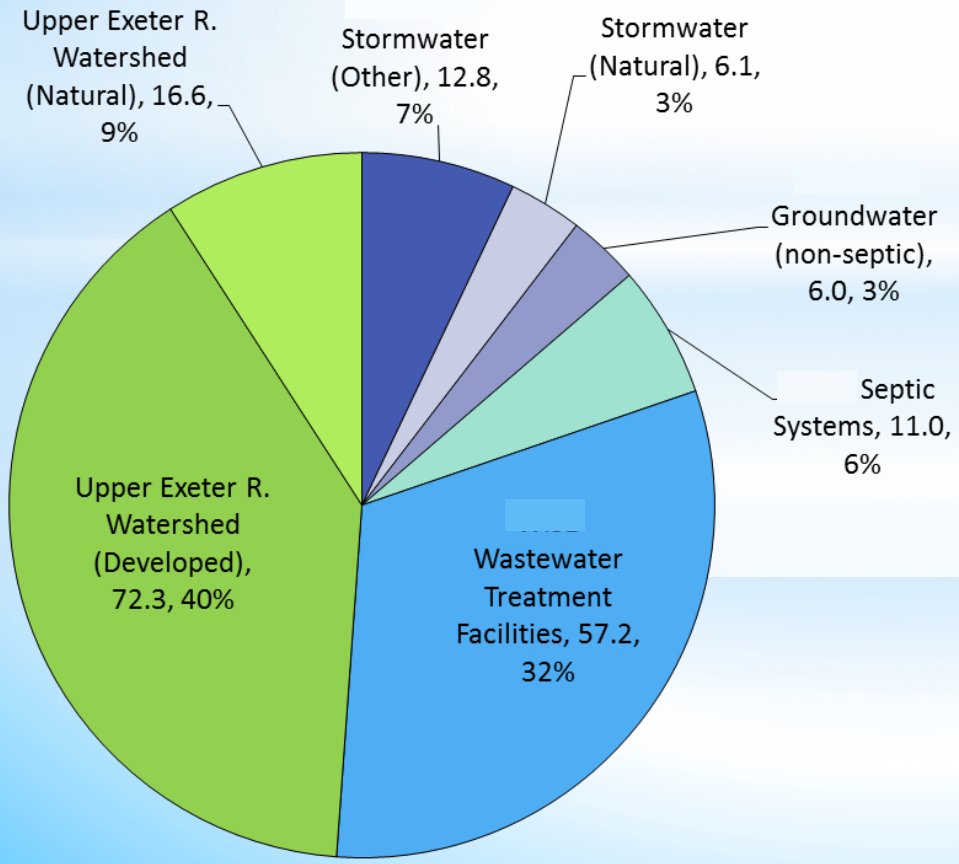


This process enables the identification of the **maximum extent practicable (MEP)**, or the point at which cost effectiveness is greatest and feasibility begins to decline.

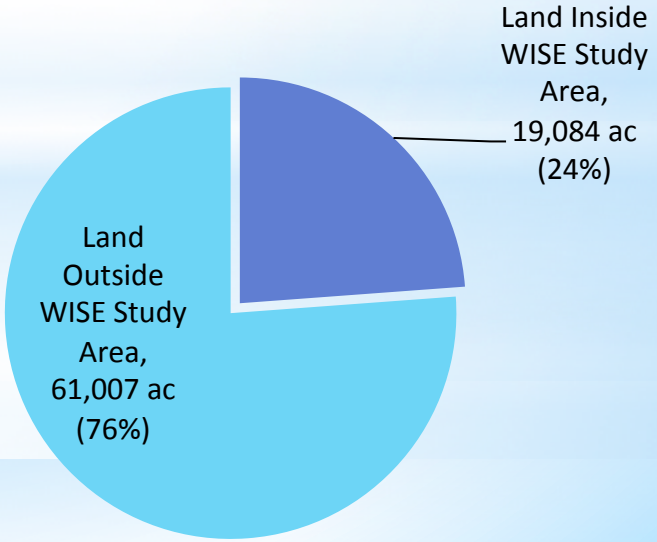
KEY FINDINGS

CHALLENGES & OPPORTUNITIES

Upper Watershed Load (49%)	**89 Tons**
Lower Watershed Load (51%)	**93 Tons**
Total Annual Watershed Load	**182 Tons**
Target Load	**88 Tons**
Future Growth Load	**???**



24% of the watershed is producing 51% of the load

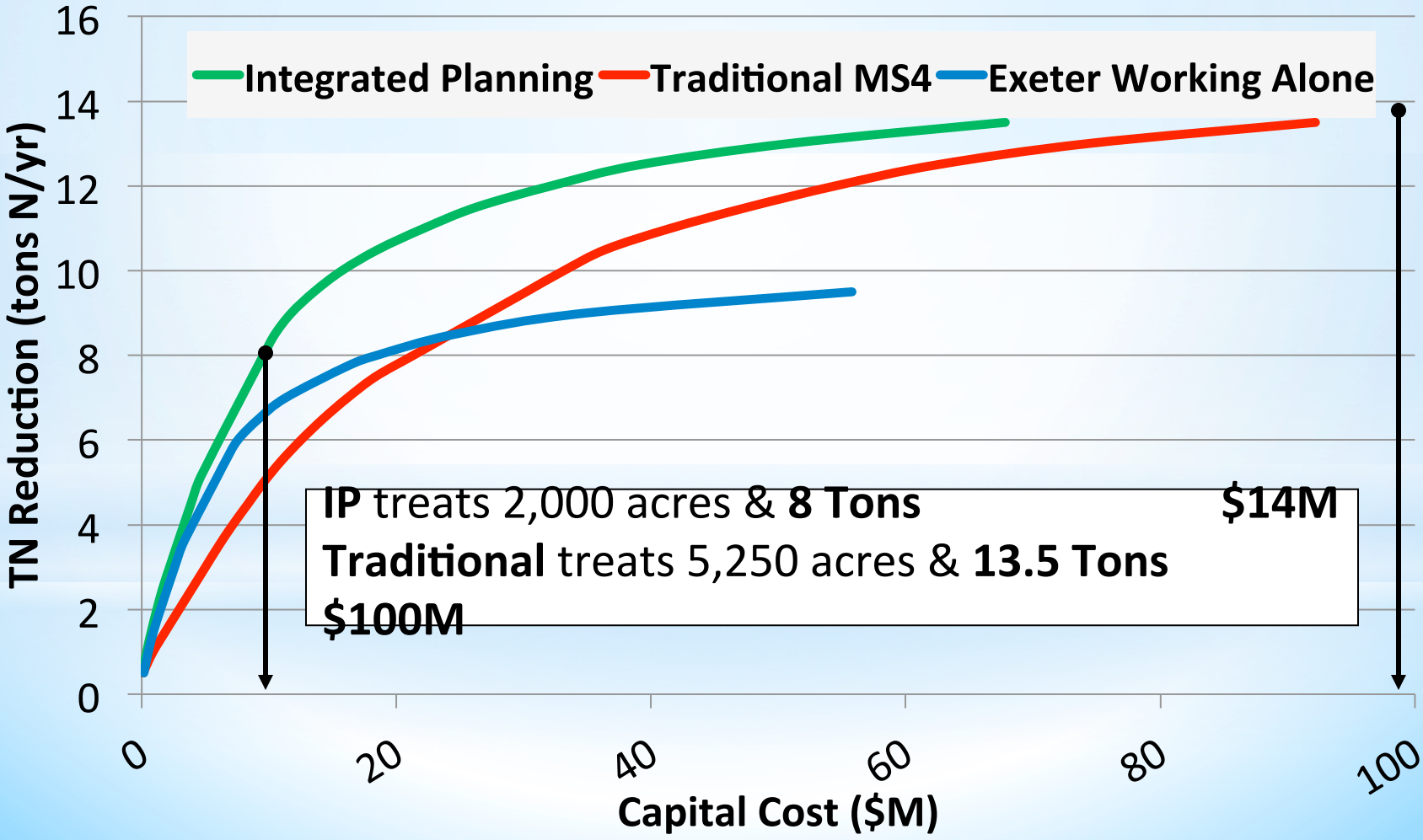


Land Area in Exeter Watershed

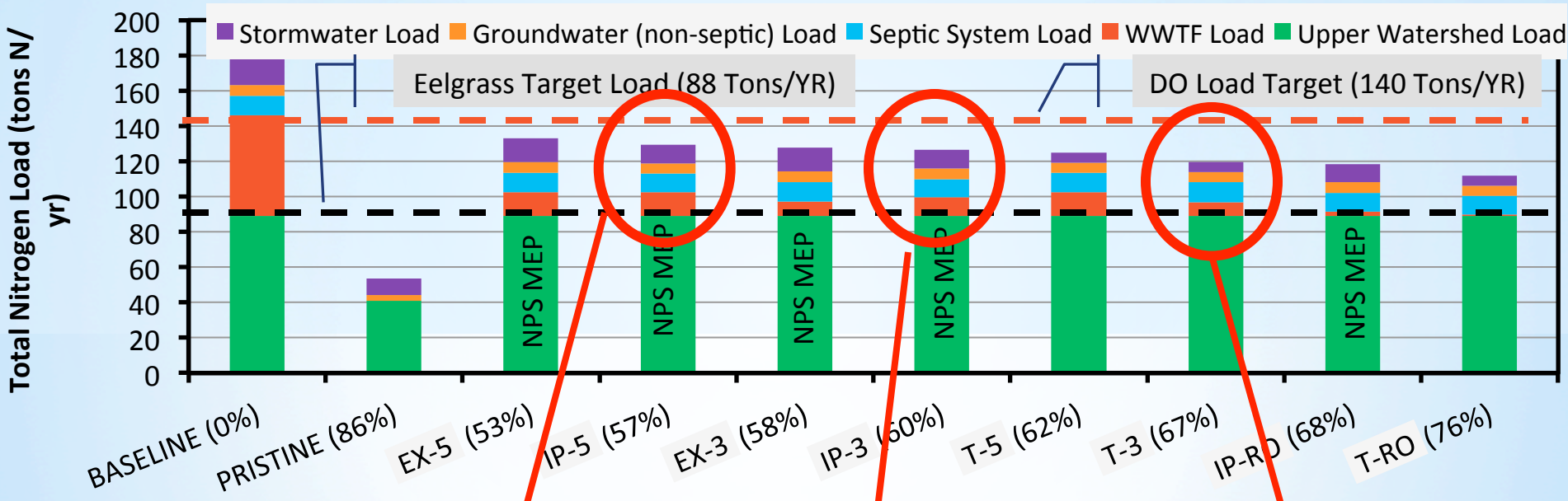
MANAGEMENT SCENARIOS

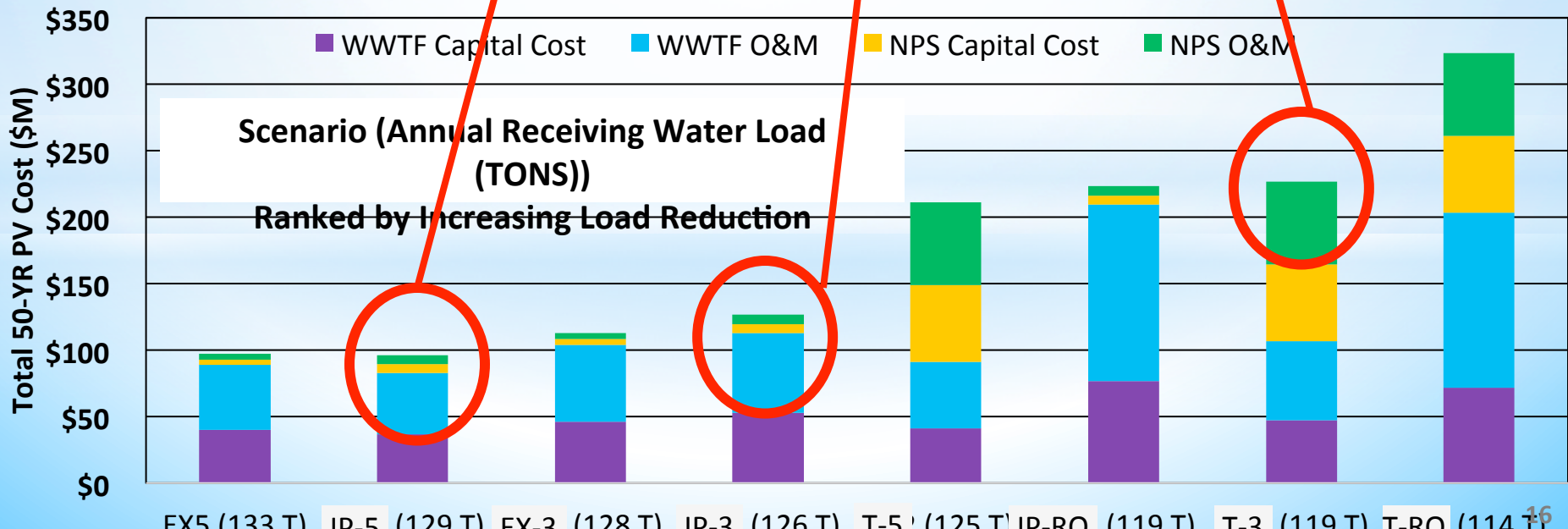
SCENARIO	WWTF DISCHARGE TARGET (MG/L)	NPS CONTROL TARGET[1]
IP-5	5	88 tons/year (Eelgrass)
IP-3	3	88 tons/year (Eelgrass)
IP-RO	<1 (Regional Outfall)	88 tons/year (Eelgrass)
EX-5	5	88 tons/year (Eelgrass)
EX-3	3	88 tons/year (Eelgrass)
T-5	5	MS4 1” capture depth on all developed land
T-3	3	MS4 1” capture depth on all developed land
T-RO	<1 (Regional Outfall)	MS4 1” capture depth on all developed land

BEST COST SOLUTION



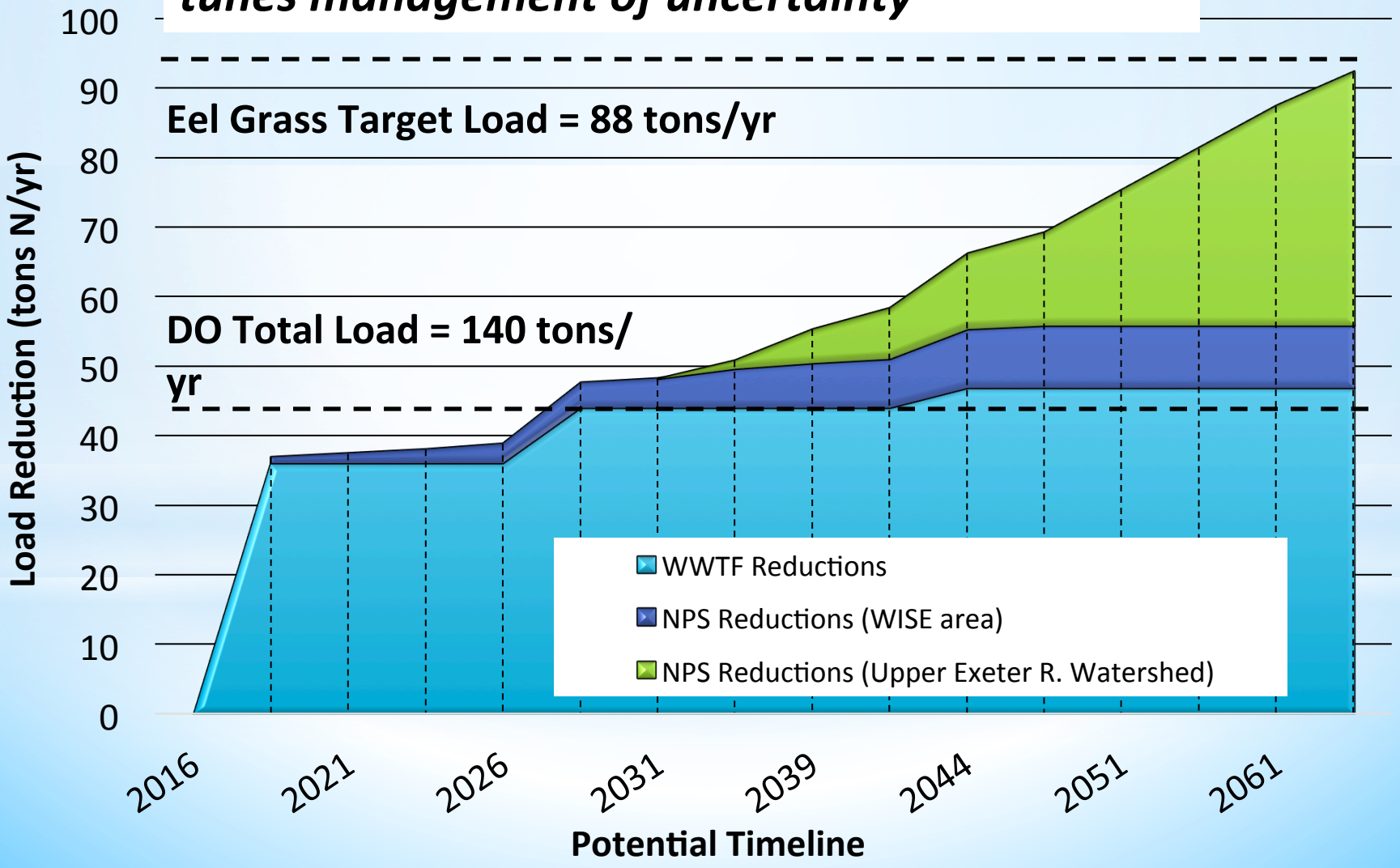
ANNUAL LOAD VS. PRESENT VALUE





POTENTIAL UPPER WATERSHED CONTRIBUTIONS TO MEET WATER QUALITY GOALS

Adaptive management and monitoring fine tunes management of uncertainty



NPS CONTROLS FOR MEP

Total Present Value of NPS Management (including O&M): $13.6 M
Total Load Reduction from NPS Management: 17,000 lb N/yr
Total Acres Treated: 2,000 acres

BMP TYPE	SIZE	LAND USE	COVER	ACRES TREATED	ACRES AVAILABLE	%
Cover Crops	-	Agriculture	-	28	28	100%
Slow Release Fertilizer Program	-	Agriculture	-	253	253	100%
Gravel Wetland	0.25	Commercial	Impervious	104	144	72%
High Efficiency Bioretention	0.25	Commercial	Impervious	29	144	20%
Subsurface Infiltration	0.25	Commercial	Impervious	12	144	8%
Dry Well	0.25	Commercial	Roof	36	36	100%
Gravel Wetland	0.25	Industrial	Impervious	47	47	100%
Dry Well	0.25	Industrial	Roof	25	25	100%
Gravel Wetland	0.25	Institutional	Impervious	94	113	83%
High Efficiency Bioretention	0.25	Institutional	Impervious	19	113	17%
Dry Well	0.25	Institutional	Roof	39	39	100%
Gravel Wetland	0.25	Outdoor and Other Built-up Land	Impervious	30	30	99%
Raingarden	0.25	Residential	Impervious	300	369	81%
Raingarden	0.5	Residential	Impervious	69	369	19%
Dry Well	0.25	Residential	Roof	252	252	100%
Lawn Fertilizer Program	-	Residential	-	-	-	-
Bioretention	0.25	Road	Impervious	112	658	17%
Gravel Wetland	0.25	Road	Impervious	546	658	83%
Street Sweeping Program	-	Road	Impervious	658	658	100%

KEY FINDINGS

- IP is more economical than traditional permitting because it satisfies elements of both the MS4 and wastewater permits.
- Maximum extent practicable (MEP) for NPS management may be feasible with a 6.5X increase for Exeter's current SW budget whereas traditional permitting would be nearly a 33X increase and is not financially feasible.
- Stratham cost of MS4 implementation is reduced by nearly 80% using IP. Extending WW to Stratham and Newfields is part of an effective Nitrogen control strategy.
- An extended implementation schedule combined with monitoring and adaptive management will help address uncertainty both in management actions and environmental response.
- "When" or "If" operating at 3 mg/l will be informed by future monitoring as to the need to achieve the designated uses.

APPLICATIONS

- The new proposed small MS4 permits for NH and MA include a requirement for optimizing and ranking retrofits opportunities.
- Optimization of designs used at the watershed scale can significantly reduce costs for achieving load reduction targets for nitrogen, phosphorous, and other pollutants.
- Optimization can be conducted for volume reduction for climate resiliency.
- Adaptive management and monitoring fine tunes management of uncertainty

ADDITIONAL INFORMATION

http://www.wisenh.net/

The WISE project has been completed!

The final WISE Integrated Plan for Stratham, Exeter and Newfields, dated December 2015 is now available.

From the Project Team, Thank You!!

Questions/ Comments?

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