Stony Brook University

SCDHS Article 19 Experimental Nitrogen Removing Biofilters

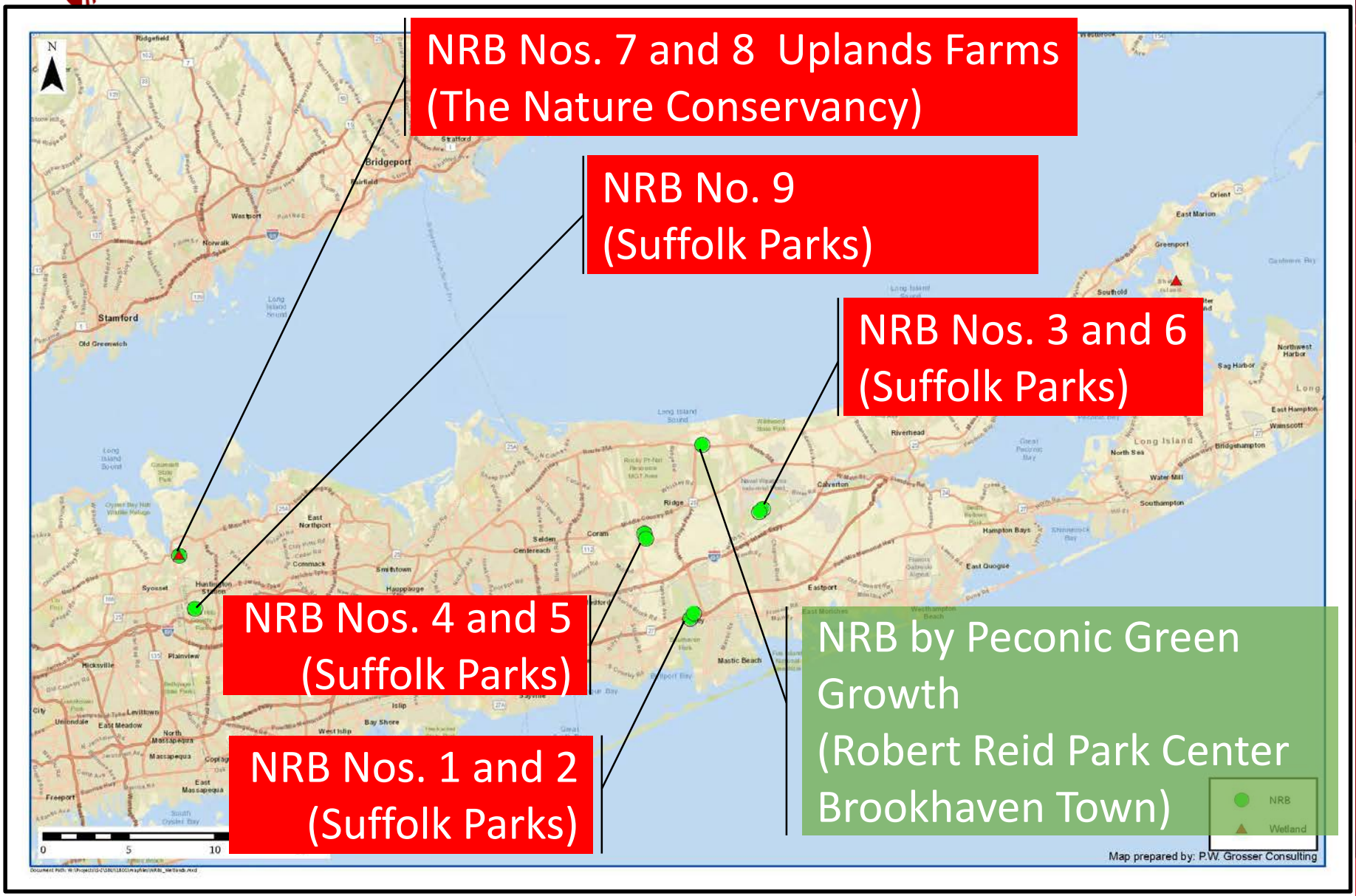
(Performance Demonstration)

Frank M. Russo, P.E.
NYS Center for Clean Water Technology

FAR BEYOND

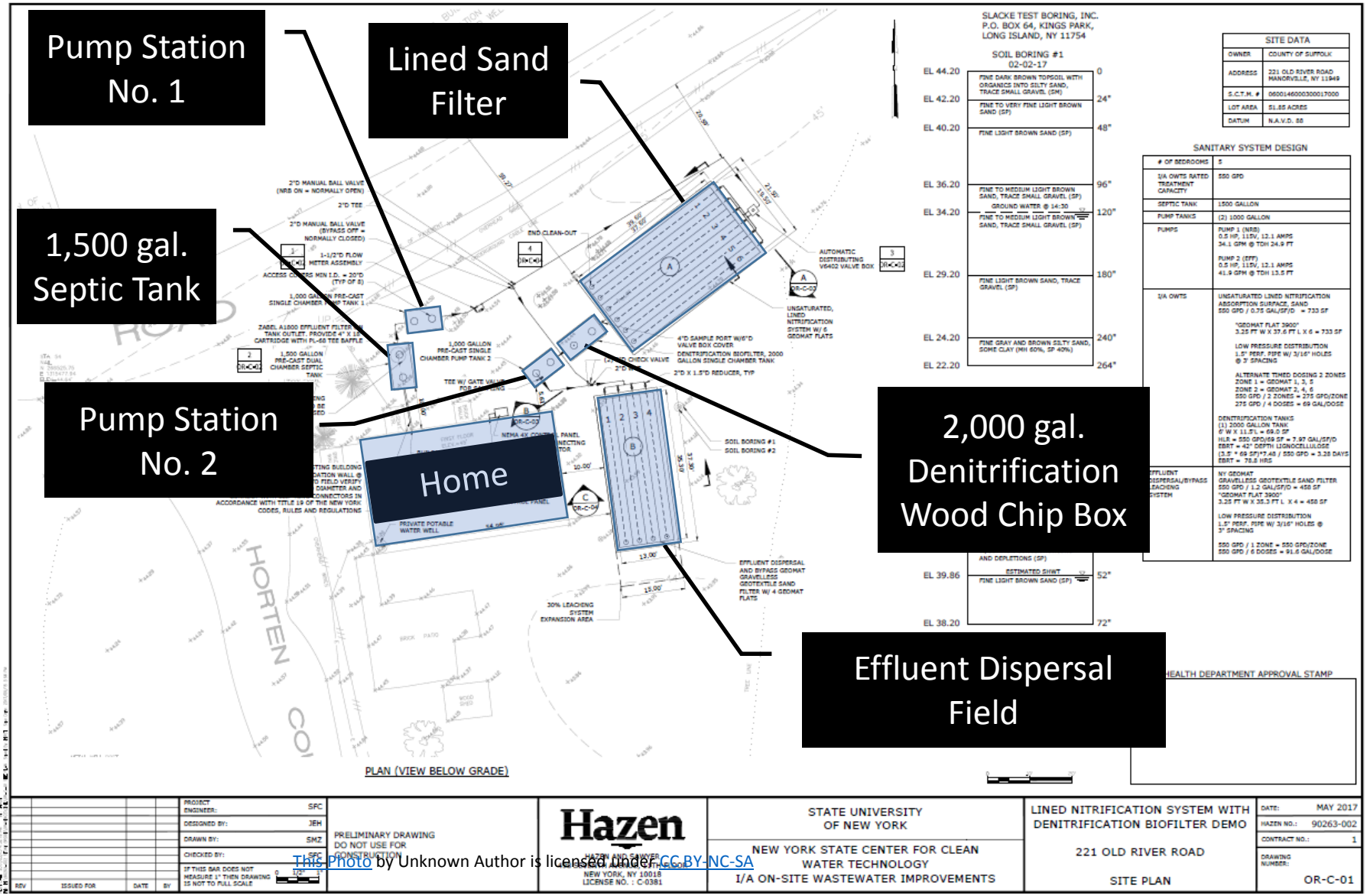
Topics

1. Overview of CCWT Experimental NRBs (NRB 1.0)
2. Research and Development of Next Generation NRBs (NRB 2.0) and *Far Beyond . . .*
3. Cost Assessment


NRB Nos. 7 and 8 Uplands Farms (The Nature Conservancy)
NRB No. 9 (Suffolk Parks)
NRB Nos. 3 and 6 (Suffolk Parks)
NRB Nos. 4 and 5 (Suffolk Parks)
NRB Nos. 1 and 2 (Suffolk Parks)
NRB by Peconic Green Growth (Robert Reid Park Center Brookhaven Town)
NRB
Wetland
Map prepared by: P.W. Grosser Consulting

Installed NRBs

NRB Ref.	Flow (GPD)	Project Location (Project Identifier)	System Type	Septic Tank (Gals.)	Pump Station Size (Gals.)	Nitrification Sand Bed (S.F.)	Bed Loading Rate (GPD/S.F.)	Denitrification Box Size
1	550	9 Private Rd., Shirley	Lined #1 (Saturated)	1,500	1,000	733	0.75	NA
2	440	59 River Rd., Shirley	Unlined #1 (Unsaturated)	1,000	1,000	880	0.5	NA
3	550	221 Old River Rd., Calverton	Box #1 (Saturated)	1,500	1,000	733	0.75	2,000



Stony Brook University

NRB Projects for 2018

NRB Ref.	Project Location (Project Identifier)	System Type	Status
4	67 Middle Island Road (SC Parks)	Boxed #2	Under Design
5	71 Yaphank Middle Island Road (SC Parks)	Lined #2	Under Design
6	264/300 Old River Road, Shirley, NY (SC Parks)	Lined #3	Under Design
7	Uplands Farms No. 1 (The Nature Conservancy)	Unlined #2	Design Pending SCDHS Approval
8	Uplands Farms No. 2 (The Nature Conservancy)	Unlined #3	Design Pending SCDHS Approval
9	10 High Hold Drive Huntington, NY (SC Parks)	Box #3	Under Design

Quick Look at Installed NRBs

Stony Brook University

Article 19 Experimental Systems Designed and Solicited for Public Bids According to State Bidding Laws November 2017

Stony Brook University

9 Private Drive – 550 GPD, Lined

Stony Brook University

59 River Road – 440 GPD, Unlined

Stony Brook University

221 Old River Road – 550 GPD, Box

- 5 Bedroom Home
- Small Lot Size
- High Groundwater
- Electrical Service

1. Overview of CCWT Experimental NRBs (NRB 1.0)

2. Research and Development of Next Generation NRBs (NRB 2.0) and *Far Beyond . . .*

Design Charrette February 15, 2018

COST!!!

(Next Generation NRB “NRB 2.0”)

Understand Cost Factors

- Absolutely had to get it right! (Conservative Designs)
- Research Features Built In (Not in “General Use” Designs)
- Limited Bid Competition
- MWBE Requirements
- Replaced Existing Septic Tanks

Understand Cost Factors

- Prevailing Wages
- High Groundwater (Dewatering)
- Could Not Use Existing Leaching Pools
- Article 19 Bypass Effluent Dispersal
- Small Sites = High Restoration Cost

Still more . . .

- New Electrical Services (10% of Construction Cost)
- Proprietary Dispersal System (>20% of Construction Cost)
- Extent of Controls & Flow Metering (Reduced in “General Use” Designs)

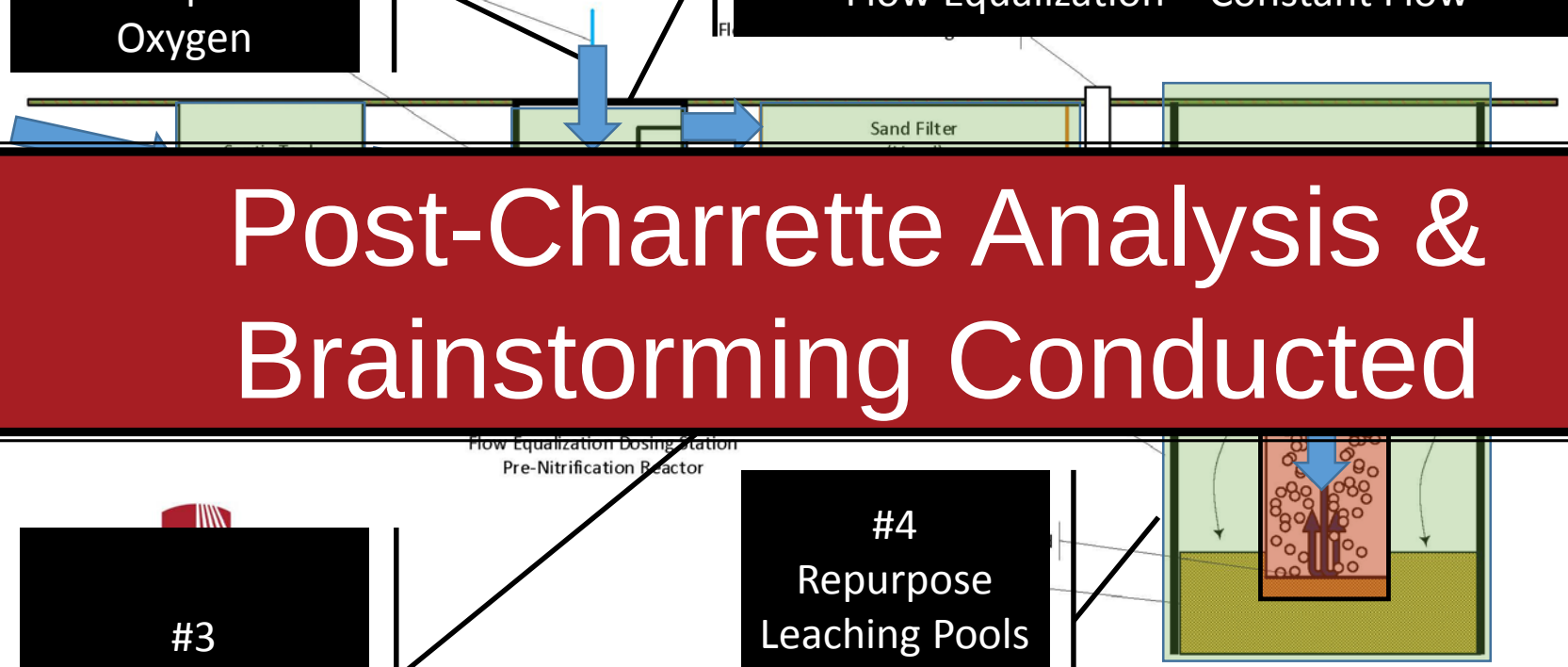
Stony Brook University

Value Engineering & Design Charrette

Next Generation NRB

#2
Introduce
Atmospheric
Oxygen

#1
Flow Equalization – Constant Flow



Post-Charrette Analysis & Brainstorming Conducted

#3
Recycle
Flow

#4
Repurpose
Leaching Pools
Bioreactor
Insert

BEYOND

New Technology Disclosure was Filed with SUNY Research Foundation on March 16, 2018 for

NRB 2.0 Intermediate Nitrification / Denitrification Bioreactor

NRB 2.0 Cost Reduction Objectives

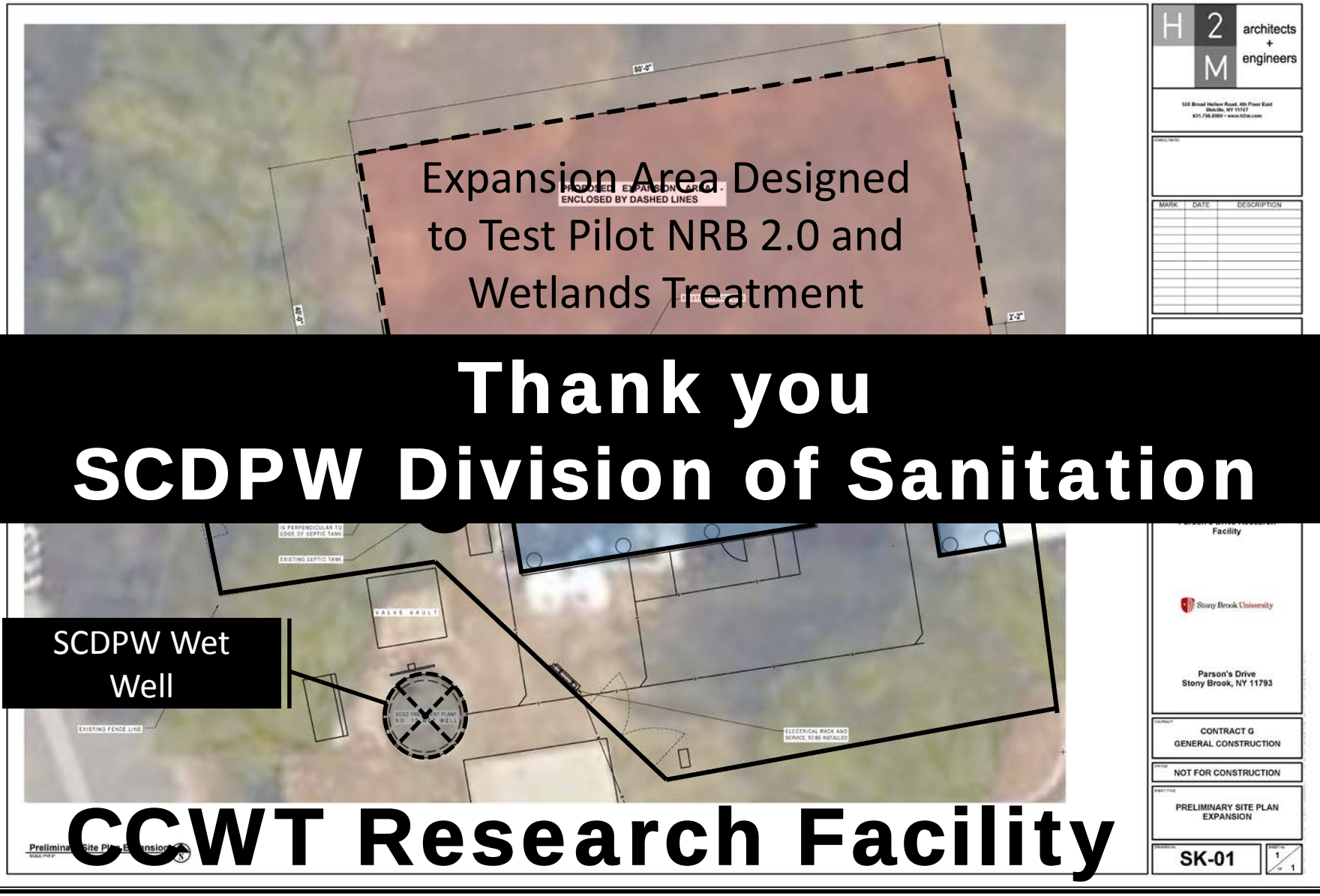
- Increase Surface Loading Rate from 0.75 GPD/Sq. Ft. to >3 GPD/Sq. Ft. (Reduce Nitrification Sand Bed Size)
- Decrease Detention Time for Wood Chips from 3 Days to 1 Day *or* Less (Decrease Size of Final Denitrification Process)
- Substantially Reduce the Amount of Controls (Passive System)

More Cost Reductions

- Use Non-Proprietary Flow Dispersal System
- Increase Competition (Commercialize Installers / Prevailing Wages)
- Use Readily Available Native Materials and Equipment
- Repurpose Existing Structures to Maximum Extent

From Theory to Development . . . (and *Far Beyond!*)

CCWT Research Facility


Expansion Area Designed to Test Pilot NRB 2.0 and Wetlands Treatment
PROPOSED EXPANSION AREA - ENCLOSED BY DASHED LINES
Thank you
SCDPW Division of Sanitation
SCDPW Wet Well
CCWT Research Facility
H 2 M architects + engineers
Stony Brook University
Parson's Drive
Stony Brook, NY 11793
CONTRACT G
GENERAL CONSTRUCTION
NOT FOR CONSTRUCTION
PRELIMINARY SITE PLAN EXPANSION
SK-01

CCWT Research Facility *Now* Under Construction

FAR BEYOND

Some **of Our Research Questions**

- ✓ Optimum Surface Loading Rate?
- ✓ Constant vs. Dosed Flow?
- ✓ Recycle Rate?
- ✓ Wood Chip Detention Time?
- ✓ Wood Chip Specifications?
- ✓ Addition of Atmospheric Oxygen?
- ✓ Understand Sources of Carbon?
- ✓ Alkalinity Introduction?
- ✓ Sand:Wood Chip Ratios?

1. Overview of CCWT Experimental NRBs (NRB 1.0)

2. Research and Development of Next Generation NRBs (NRB 2.0) and *Far Beyond . . .*

3. Cost Assessment

How Much?

NRB Location	Type	Publicly Bid Amount for Art. 19 "Experimental System"
9 Private Drive	Lined 550 GPD	$57,500
59 River Road	Unlined 440 GPD	$65,800
221 Old River Rd.	Box 550 GPD	$75,000

We are confident that our NRB 2.0 enhancements will prove out and that a commercialized Article 19 "General Use" unlined system will cost about $15,000 for a typical installation. . .

Not quite our goal, but we are working on it.

Typical Installation:

1. Installations becomes common place and a robust industry develops with pre-qualified installers
2. Groundwater is not encountered
3. Repurpose existing leaching pools
4. Usable Septic Tank
5. Extensive restoration is not necessary
6. Electrical service does not have to be upgraded

Stony Brook University

DEPARTMENT OF ENVIRONMENTAL CONSERVATION · NEW YORK STATE ·

SUNY RF
The Research Foundation for
The State University of New York

SUFFOLK COUNTY SEAL · NEW YORK · FREEDOM AND INDEPENDENCE

MASSTC
The Massachusetts Alternative Septic System Test Center
A Division of the Barnstable County Department of Health and Environment

Stony Brook University
NYS Center for Clean Water Technology

Reclaim our Water

The Nature Conservancy

TOWN OF BROOKHAVEN NEW YORK 1655

EXCAV SERVICES

Hazen

RJ

PWGC
Strategic Environmental Engineering Solutions

H2M

FAR BEYOND

Questions?

frank.russo.3@stonybrook.edu

Stony Brook University | Center for Clean Water Technology