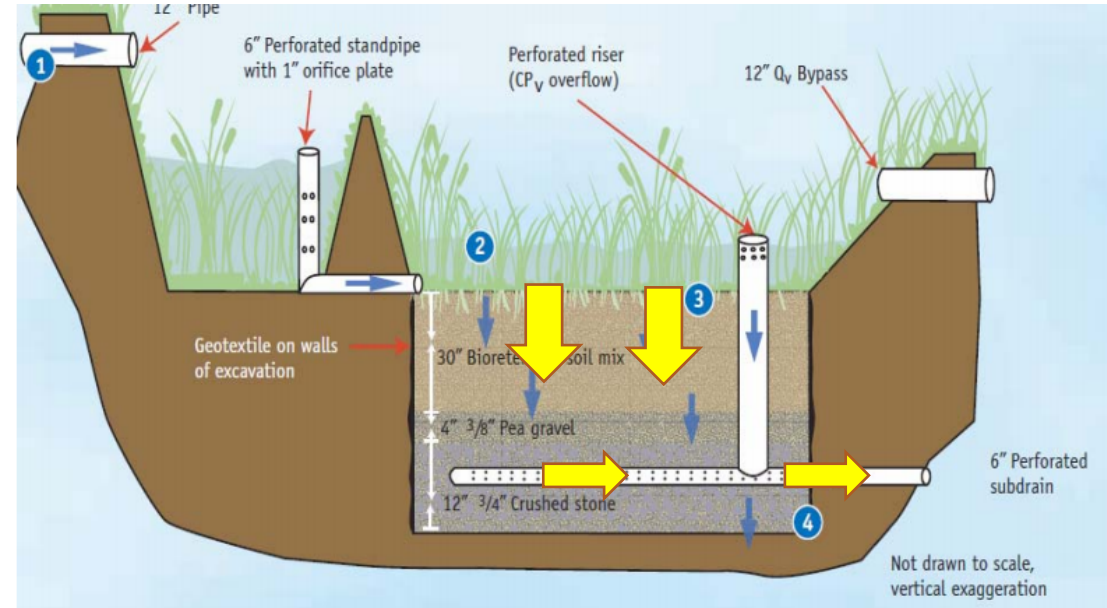
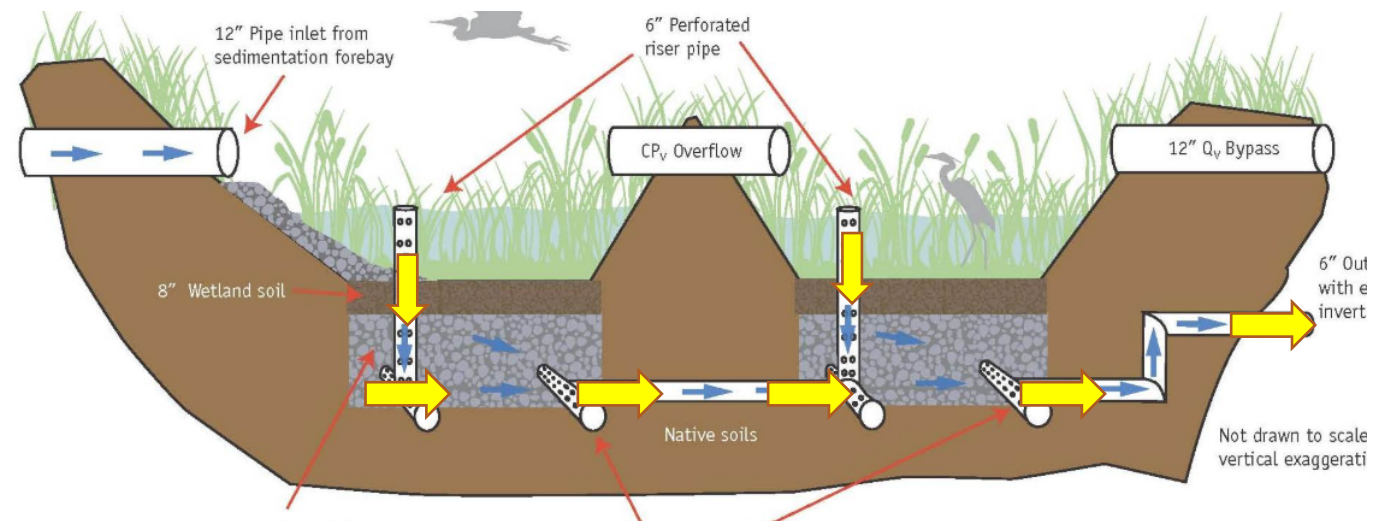


# Stormwater Treatment Practices

- Bioretention
  - Low Phosphorous
  - High Hydraulic Conductivity



- Gravel Wetlands
  - Low Phosphorous
  - Low Hydraulic Conductivity



# Gravel Wetland Specification

- >15% organic matter
- Free of objects larger than two inches (2")
- Phosphorous between 10 and 30 mg/kg (Mehlich-3 or equivalent)
- pH between 6.0 and 7.0
- Hydraulic conductivity 0.1 - 0.01 ft/day
- Well pulverized and composted leaf mulch
- No Manure in feedstock

# Gravel Wetland Project #1

- 160 yards of wetland soil



# Gravel Wetland Project #1

- First Submittal: Rejected due to animal manure

<b>Results</b>	<b>Analysis</b>	<b>Dry Weight Basis</b>	<b>Moist (as received) Weight Basis</b>	<b>Moist (as received) Volume Basis</b>
pH	7.46			
Soluble Salts	4.50 mmhos/cm			
Bulk Density				
Percent Solids				765 lbs/cub yd
Moisture Content			43.3 %	331 lbs/cub yd
Organic Matter		61.2 %	26.5 %	434 lbs/cub yd
Total Nitrogen		1.74 %	0.76 %	203 lbs/cub yd
Organic Nitrogen		1.70 %	0.74 %	5.78 lbs/cub yd
Nitrate Nitrogen		374 mg/kg	162 mg/kg	5.64 lbs/cub yd
Ammonium Nitrogen		35.0 mg/kg	15.2 mg/kg	
Total Carbon		33.0 %	14.3 %	
C:N Ratio		18.9		109 lbs/cub yd
Phosphorus		0.53 %	0.23 %	
Potassium		1.61 %	0.70 %	1.74 lbs/cub yd
Calcium		4.10 %	1.77 %	5.32 lbs/cub yd
Magnesium		0.59 %	0.26 %	13.6 lbs/cub yd
				1.97 lbs/cub yd
<b>Material:</b> Finished		<b>Feedstock:</b> Cow manure, sawdust, horse manure, chicken manure, wood chips, leaves, peat moss		
<b>Age in weeks:</b>		<b>Intended Use:</b> Potting Media, Landscape Soil Amendment, Landscape Mulch,		
<b>Compost Method:</b> Windrow		<b>Interpreting your Compost Test Results</b> <a href="http://soiltest.umass.edu/fact-sheets/interpreting-your-compost-test-results">http://soiltest.umass.edu/fact-sheets/interpreting-your-compost-test-results</a>		

# Gravel Wetland Project #1

- Second Submittal: Compost Component Approved

- Organic Matter
  - 16.3%
- Hydraulic Conductivity
  - 0.17 ft/day
- Phosphorous
  - 10.7 mg/kg

## The Following Was Performed and Recorded:

Sampled By: The Client

Sample Description: Wetland Soil

Source: Stockpile at VERMONT COMPOST S PIT

Weight of Sample: 20319.5 grams

## RESULTS:

-1- pH (ASTM D-4972): 7.5

-2- Organics (ASTM C-40): 16.3% (>15%) OK (Sand Content 100-16.3= 83.7%)

-3- Nitrogen: Very Low or add 22-22.5 oz/100ft<sup>2</sup>

-4- Magnesium: Very Low or add 2.0-2.5 oz/100ft<sup>2</sup>

-5- Phosphorous (P<sub>2</sub>O<sub>5</sub>) {Mehlich-3 Equivalent}: Very Low or add 0.25-1.0 oz/100ft<sup>2</sup> or OK (Will Not Leach)

-6- Potassium (K<sub>2</sub>O): Medium or add Zero oz/100ft<sup>2</sup>

-7- Soluble Salt: 49 ppm (Less than 500 ppm) or OK

-8- Hydraulic Conductivity (ASTM D-2434):

1.694x10<sup>-2</sup> ft/day [Tested @ 95.2 pcf] (Between 0.01 and 0.01 ft/day) or OK

-9- Phosphorus Index (P-index) was 10.7 mg/kg (Between 10 and 30 mg/kg)



# Gravel Wetland Project #1

- Third Submittal: Final Mix Approved



# Gravel Wetland Project #2

- Two Gravel Wetlands, 165 yards of wetland soil



# Gravel Wetland Project #2

- First Supplier:
  - Rejected due to Phosphorous
  - 149 ppm using Modified Morgan
  - Wanted to use Water Extractable Phosphorus test

## Results

Analysis	Value Found	Optimum Range	Analysis	Value Found	Optimum Range
Soil pH (1:1, H2O)	7.1		Cation Exch. Capacity, meq/100g	22.9	
Modified Morgan extractable, ppm			Exch. Acidity, meq/100g	0.0	
<i>Macronutrients</i>			<b>Base Saturation, %</b>		
Phosphorus (P)	149.2	4-14	Calcium Base Saturation	65	50-80
Potassium (K)	1481	100-160	Magnesium Base Saturation	18	10-30
Calcium (Ca)	3000	1000-1500	Potassium Base Saturation	17	2.0-7.0
Magnesium (Mg)	502	50-120	<b>Scoop Density, g/cc</b>	0.89	
Sulfur (S)	38.6	>10	<b>Optional tests</b>		
<i>Micronutrients *</i>			Soil Organic Matter (LOI), %	9.0	
Boron (B)	2.8	0.1-0.5	Soluble Salts (1:2), dS/m	1.09	<0.6
Manganese (Mn)	18.5	1.1-6.3	Nitrate-N (NO3-N), ppm	124	
Zinc (Zn)	4.1	1.0-7.6			
Copper (Cu)	0.2	0.3-0.6			
Iron (Fe)	2.7	2.7-9.4			
Aluminum (Al)	9	<75			
Lead (Pb)	4.0	<22			

\* Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.

## Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

Phosphorus is excessive.



# Gravel Wetland Project #2

- Second Supplier:
  - Feedstock: Leaves, food scraps, yard trimmings, wood chips, manure
  - Hydraulic Conductivity too high (better for Bioretention Mix)
  - Product would have required amending and testing
  - Not Tested as a Gravel Wetland Soil

# Gravel Wetland Project #2

- Third Supplier:
  - Feedstock: Leaf based compost
  - Noted ability to achieve a 15% Organic Matter content while maintaining a low phosphorous by adding peat
  - Recommended using something more local
  - Not Tested as a Gravel Wetland Soil

# Gravel Wetland Project #2

- Approved Submittal:
  - Used same supplier as Project #1
  - Retested Material for this project



## TEST RESULTS:

Weight of Organics= 76.93 grams  
Weight of Sample=402.8 grams

**ORGANIC CONTENT : 19.1%**

**ORGANIC PORTION CONTAINED COMPOSTED LEAF MULCH THAT WAS WELL PULVERIZED.**

SPECIFICATIONS: 15-20%

MEETS SPECIFICATIONS: YES

**PHOSPHOROUS INDEX OR P-INDEX : 12.9 mg/kg**

SPECIFICATIONS: 10-30 mg/kg

MEETS SPECIFICATIONS: YES

**HYDRAULIC CONDUCTIVITY TEST REPORT {constant head method}**  
**(ASTM D-2434)**

Constant Head Permeability **K: 0.045 ft/day {density as tested @ 96.9% of ASTM D-1557}**

SPECIFICATIONS: 0.01<0.045<0.1 ft/day

MEETS SPECIFICATIONS: YES

