# Road Management Plan for Brackett and Pond Roads, Wakefield, NH

Prepared by
The University of New Hampshire Stormwater Center

Prepared with Support from NH Department of Environmental Services
May 2011

# General Approach

Site Survey

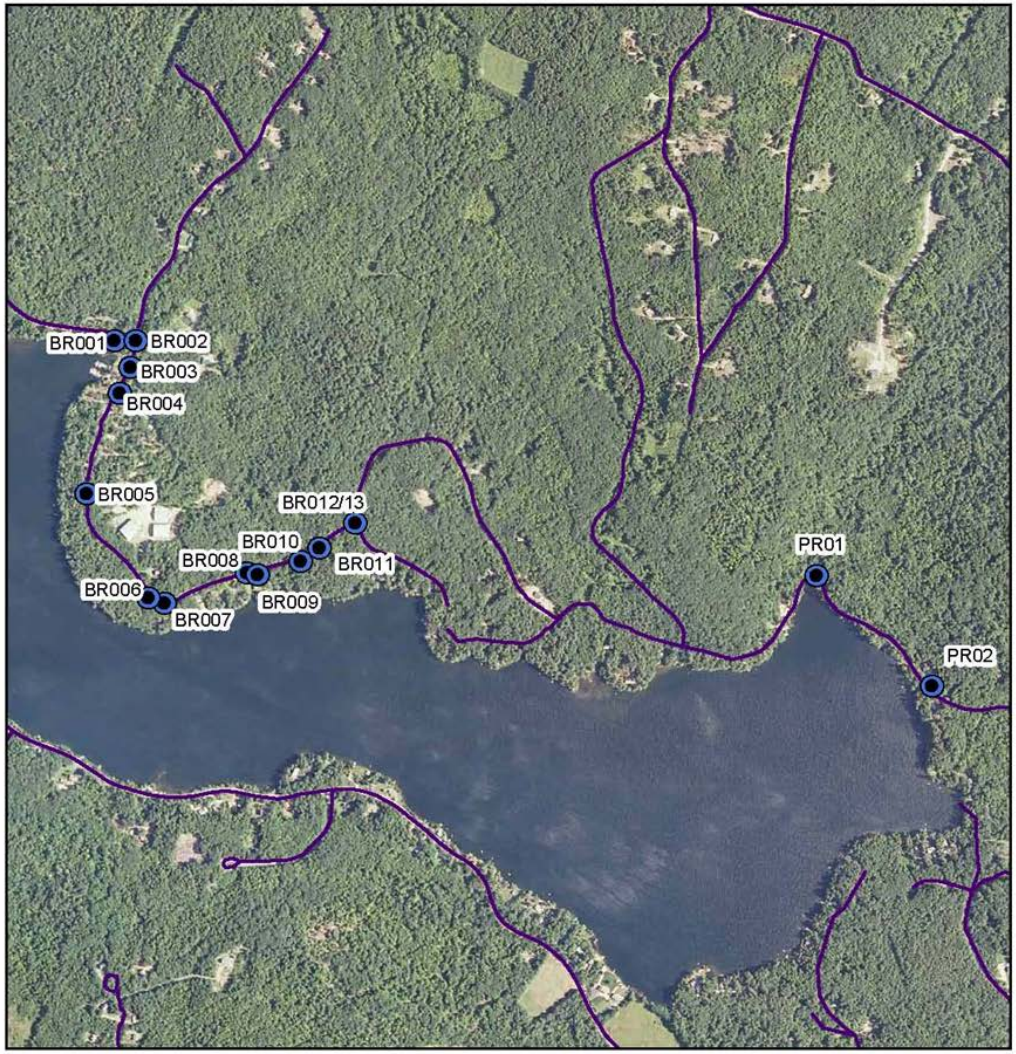
Identification of target areas

Prioritization and pollutant load modeling

Confirmation

Design

Installation and Oversite




*Map Source:*

NH Public Roads was provided by the New Hampshire Department of Transportation and downloaded from the UNH Complex Systems Research Center through NH GRANIT at www.granit.unh.edu. (http://www.granit.unh.edu/data/datacat/pages/roads_dot.pdf)
2009 National Agricultural Imagery Program (NAIP) Imagery - 15 Minute Quads was provided by the USDA FSA APFO Aerial Photography Field Office and downloaded from the UNH Complex Systems Research Center through NH GRANIT at http://www.granit.unh.edu/data/datacat/pages/2009naip.pdf

Legend

Proposed BMP Location

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*Drawn By:* James Sherrard Jr.
*Reviewed By:* <Initials>
*Date Prepared:* 5.19.2011

0 250 500 1,000 1,500 2,000 Feet

N

*Drawing Title:*

Brackett Road

*Brackett Road Management Plan*

Brackett Road, Wakefield, NH

*Figure #:* 1

| Source Area Unit | TSS mg/L | TP mg/L | Reference |
|---|---|---|---|
| Unimproved Poorly Maintained Gravel Surface | bs Range 6.0- | NA | (Clinton, 2003) |
| Gravel Road | 197-885 | 0.23-0.99 | (Sheridan, 2007) |
| Transportation/Communication/Utility Runoff | 100 | 0.2 | (Hagan and Walker, 2006) |

| Treatment Strategy | TSS Removal Efficiency | TP Removal Efficiency | Reference |
|---|---|---|---|
| **Ditch-Turnouts** | 31% | -16% | (Winer, 2000) Removal Percentages for a Ditch |
| **Sediment Basin** | 50% | | UNHSC |
| **Catch Basin** | 10% | | UNHSC |
| **Infiltration Basins** | 90% | 65% | (McCarthy, 2008) |
| **Infiltration Trenches** | 90% | 60% | (McCarthy, 2008) |
| **Dry Well** | | | NA |
| **Stabilized Roadside Ditches** | 30% | | UNHSC |
| Vegetated/grassy swales (As a stabilized Roadside Ditch?) | 70% | 29% | (Storey, 2009) (Kahn et al. |
| Stone Swale | 50% | | UNHSC |
| Grassed Channel | 68% | 29 - 43% | (Winer, 2000) (Zhang, 2009) |
| Bioretention Area | 88% | | UNHSC |
| **Road Crossing and Conveyance** | 30% | | UNHSC |
| Water Bar | | | NA |
| Stabilized Dips | | | NA |
| Rubber Razors | | | NA |
| **Energy Dissipaters** | 10% | | UNHSC |
| Internal | | | NA |
| Natural Scour Hole | | | NA |
| External | | | NA |
| Stilling Basin | | | NA |

Table 1: Summary of characteristics for study streams.

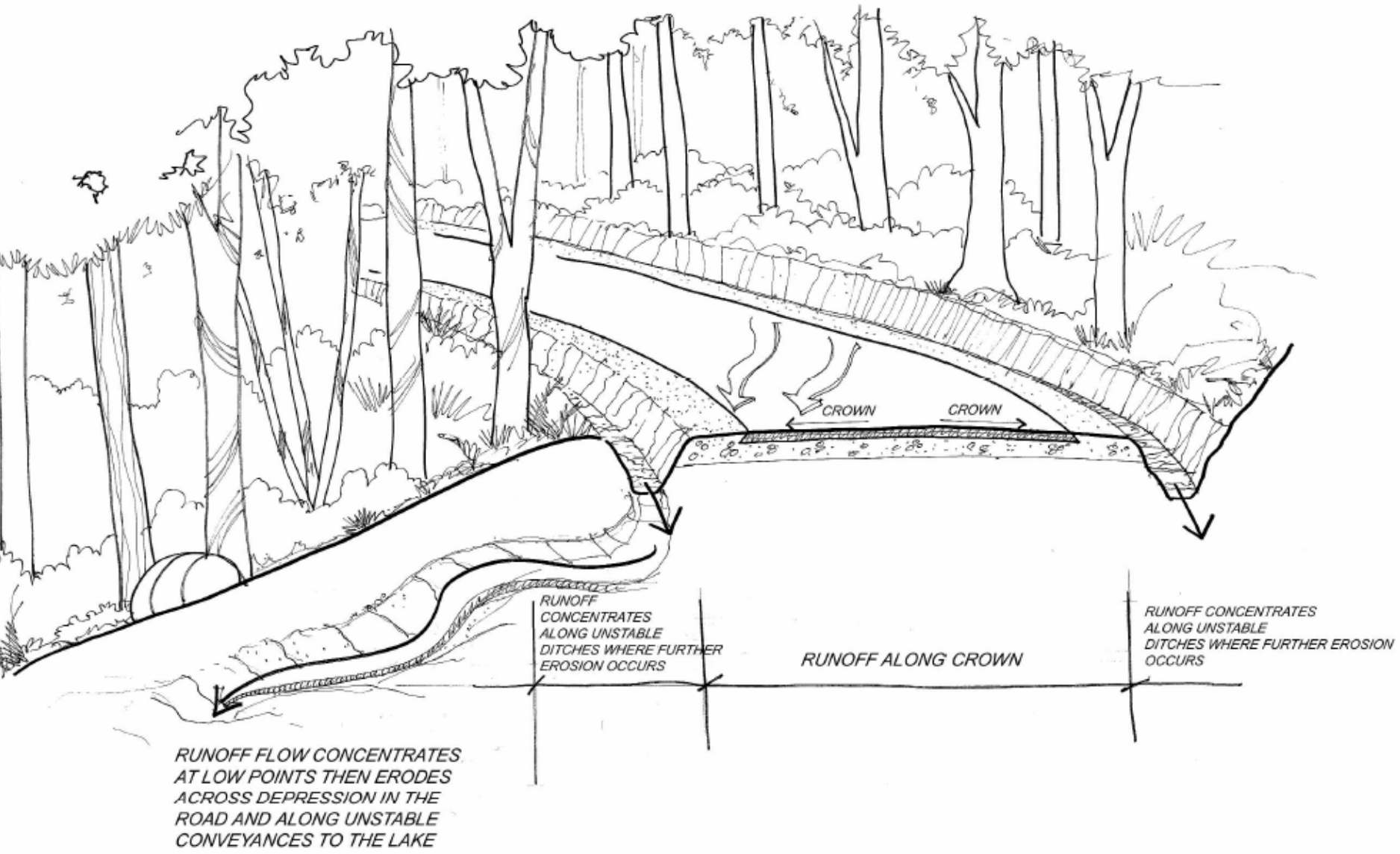
| Stream | 303 (d) Listing Status | Watershed Size ($km^2$) | Mean Elevation (m) | Mean Slope (%) | Aspect | TSS Sample size | OM Sample size |
|---|---|---|---|---|---|---|---|
| Addie Branch | Unlisted | 5.6 | 925 | 19 | ENE | 255 | 66 |
| Pounding Mill | Threatened | 1.3 | 706 | 14 | SSE | 194 | 130 |
| Reed Mill | Threatened | 4.4 | 700 | 14 | S | 272 | 86 |
| Roach Mill | Impaired | 0.8 | 712 | 16 | SSE | 202 | 64 |

| TP/TSS ratio | |
|---|---|
| average | 0.006 |

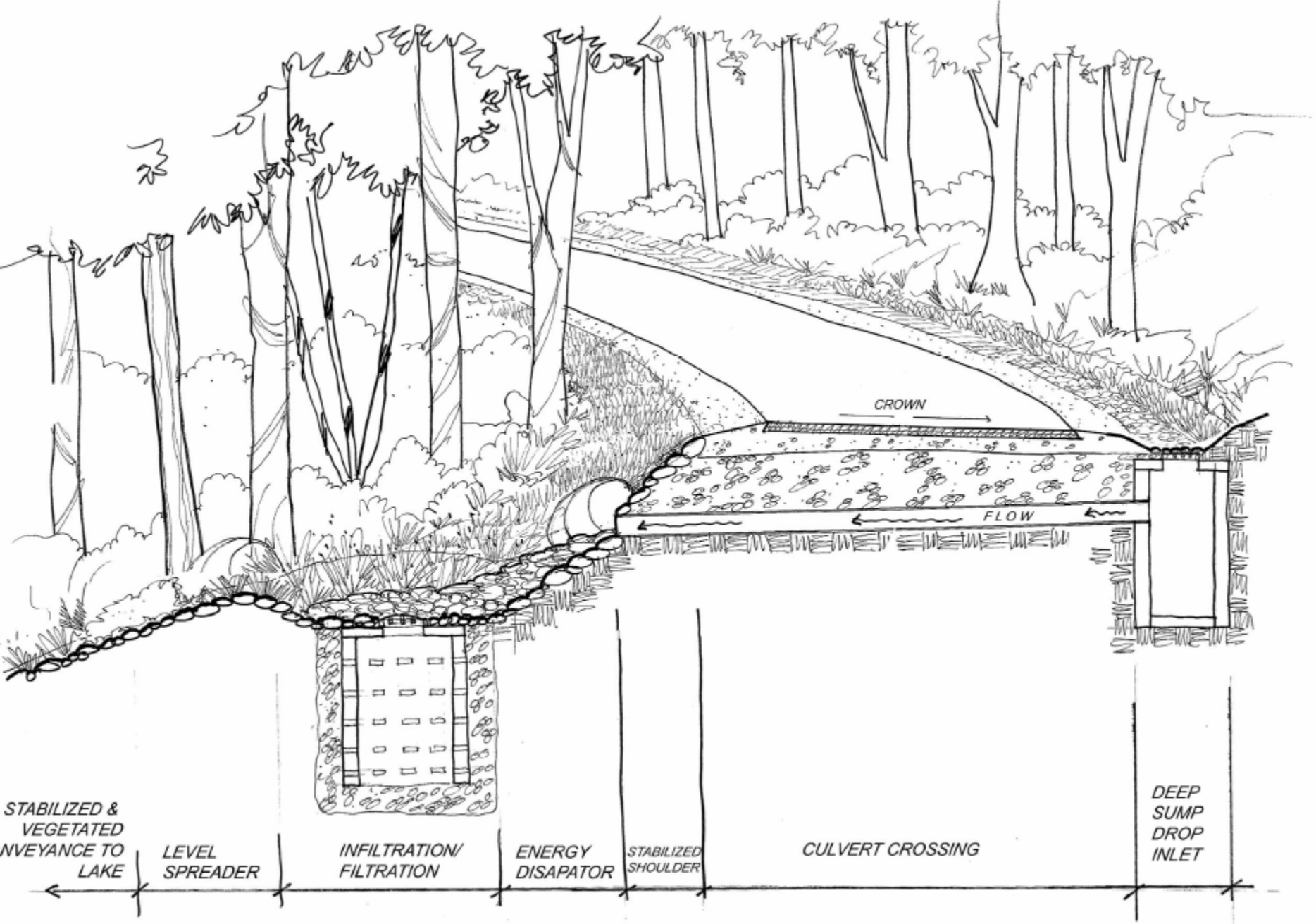
average 197

# Prioritization of Target Areas

| Location | Approx Drainage Area (ft2) | Approximate Drainage Area Description | Discharges to | Slope/Distance to water or forest | Estimated annual TSS load (lbs/yr) | Estimated annual TSS load post tx (lbs/yr) | Estimated annual TSS load eliminated | RE% | Cost |
|---|---|---|---|---|---|---|---|---|---|
| #BR001 | 2,300 | 2300 ft2 | Lovell Lake | 30° < ≈ 50 ft to Water | 397 | 25 | 373 | 94% | $ 236.00 |
| #BR002 | 34,500 | 23,000 ft2 from Lovell Heights Rd and 11,500 ft2 from Adjacent Shared Drive | Lovell Lake | Variable-Very Steep > 15% | 8,939 | 1,016 | 7,923 | 89% | $ 6,040.00 |
| #BR003 | 4,400 | 4,400 ft2 | Lovell Lake | 75 ft | 760 | 141 | 619 | 81% | $ 1,148.50 |
| #BR004 | 60,000 | 60,000 ft2 - Road (BR) + 2 Camp Roads w 5-6 House Each… Each House 25,000 ft2 | Natural Drain Path to Lake | ~ 10% Roughly 300 ft. | 10,364 | 1,178 | 9,186 | 89% | $ 3,730.00 |
| #BR005 | 35,000 | 35,000 ft2 ~ 150 ft of Dirt RD | Lot 524 & to Lovell Lake | Variable Steepening Slope Through 524 BR | 9,069 | 1,284 | 7,785 | 86% | $ 4,876.00 |
| #BR006 | 24,000 | 24,000 Half RD (~14 ft. + 250 ft. Length) | Driveway Across from 629 Brackett Road | Steep > 10% Down to Lovell Lake | 4,146 | 257 | 3,889 | 94% | $ 2,431.00 |
| #BR007 | 32,000 | 32,000 ft2 | Swale to Lovell Lake | Steep > 15% | 8,291 | 1,174 | 7,118 | 86% | $ 1,905.00 |
| #BR008 | 6,500 | 6,500 ft2 | Swale Along Side of 726 Brackett Road | Moderate to Steep | 1,684 | 238 | 1,446 | 86% | $ 3,923.57 |
| #BR009 | 7,100 | 7,100 ft2 | Homeowner Step Pool in Front of 740 Brackett Road | Moderate to Steep | 1,840 | 260 | 1,579 | 86% | $ 3,990.00 |
| #BR010 | 3,600 | 3,600 ft2 | Driveway of 722 & 758 Brackett Road | Moderate | 622 | 88 | 534 | 86% | $ 3,704.29 |
| #BR011/12 | 20,000 | 11) 12,000 ft2 12) 8,000 ft2 | 11) Forest 12) Wetland forest | Steep | 5,182 | 990 | 4,192 | 81% | $ 2,454.13 |
| #BR013 | 25,000 | 25,000 ft2 | Private property and stream channel | Moderate | 4,318 | 268 | 4,051 | 94% | $ 6,872.43 |
| #PR002 | 6,600 | 6600 ft2 | Forested area alongside Pond Road | Moderate to Steep | 1,710 | 242 | 1,468 | 86% | $ 3,901.00 |
| Totals | 261,000 | | | | 55,612 | 6,919 | 50,161 | 90% | 45,212 |




# EXISTING CONDITIONS




IMPROVED CONDITION

# Examples – BR008 Existing

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# Examples – BR008 Improved

# Examples – BR008 Improved

# Examples – BR008 Improved

# Examples – BR009 Existing

# Examples – BR009 Existing

# Examples – BR009 Existing

# Examples – BR009 Improved

# Examples – BR009 Improved

# Examples – BR009 Improved

# Annual Pollutant Load Reductions 2012

| Location | Drainage Area (roadway and shoulder) (ft2) | Slope/Distance to water or forest | Estimated annual TSS load (lbs/yr) | Estimated annual TSS load post treatment (lbs/yr) | RE% | Estimated annual TP load (lbs/yr) | Estimated annual TP load post treatment (lbs/yr) | RE% |
|---|---|---|---|---|---|---|---|---|
| #BR008 | 9,800 | Steep | 2539 | 252 | 90% | 15.37 | 1.52 | 90% |
| #BR009 | 10,920 | Steep | 2829 | 275 | 90% | 17.13 | 1.67 | 90% |
| #BR013 | 15,600 | Moderate | 2695 | 283 | 90% | 16.31 | 1.71 | 90% |
| **Totals** | | | **13867** | **1949** | | **84** | **12** | |

| | |
|---|---|
| Total annual TSS Load Reduced (lbs) | 11,918 |
| Total annual Phosphorus Load Reduced (lbs) | 72 |

# Dirt Road Aggregate-used

**Table 1: Town of Wakefield road aggregate particle size distribution.**

| US sieve number | Sieve opening (mm) | Mass retained (g) | Mass passing (g) | Percent Passing (%) |
|---|---|---|---|---|
| 1.5" | 38.10 | 0.0 | 1570.0 | 100.0 |
| 0.75" | 19.05 | 294.4 | 1275.6 | 81.3 |
| #4 | 4.75 | 261.2 | 1014.4 | 64.6 |
| #16 | 1.18 | 253.4 | 761.0 | 48.5 |
| #200 | 0.075 | 739.0 | 22.0 | 1.4 |
| Pan | <.075 | 22.0 | 0.0 | 0.0 |

# Dirt Road Aggregate-recommended

**Table 2: Percent specs from ME Manual 1.5 – ¼" minus, 7-12% fines; Bluestone gravel is the best…**

| US sieve number | Sieve opening (mm) | Mass retained (g) | Mass passing (g) | Percent Passing (%) |
|---|---|---|---|---|
| 1.5" | 38.10 | 0.0 | 1570.0 | 100.0 |
| 0.75" | 19.05 | 294.4 | 1275.6 | 81.3 |
| #4 | 4.75 | 261.2 | 1014.4 | 64.6 |
| #16 | 1.18 | 253.4 | 761.0 | 48.5 |
| #200 | 0.075 | 739.0 | 22.0 | 7-12 |
| Pan | <.075 | 22.0 | 0.0 | 0.0 |

| Sieve Size | Percent Passing |
|---|---|
| 1.5" | 100 |
| 0.75" | 65 – 95 |
| #4 | 30 – 65 |
| #16 | 15 – 30 |
| #200 | 10 – 15 |

# Province Lake Road Management Plan Implementation Phase I

***May 20, 2015***

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FB environmental

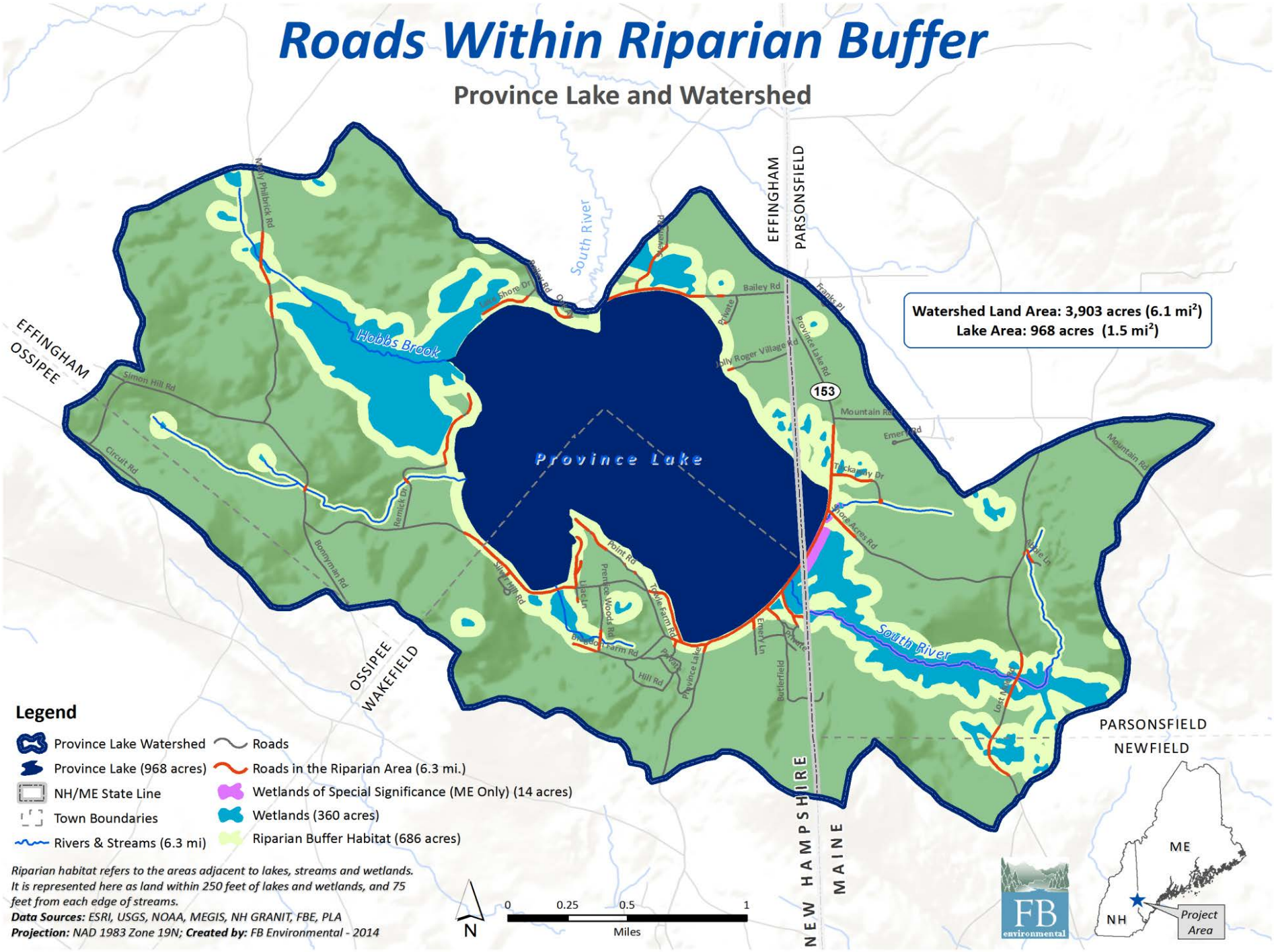
# Province Lake

## *Physical Characteristics*

- **2 States, 3 Towns**
- **Lake Area** ~ 967 acres
- **Watershed** – 3903 acres
- **Avg. depth** – 9 feet
- **Max. depth** – 16 feet
- **Low Flushing Rate-** 1.1/year
- **Shallow, non-stratified** – wind driven system
- **Small Watershed relative to lake surface area**

# Roads Within Riparian Buffer

## Province Lake and Watershed




*Riparian habitat refers to the areas adjacent to lakes, streams and wetlands. It is represented here as land within 250 feet of lakes and wetlands, and 75 feet from each edge of streams.*

***Data Sources:*** *ESRI, USGS, NOAA, MEGIS, NH GRANIT, FBE, PLA*

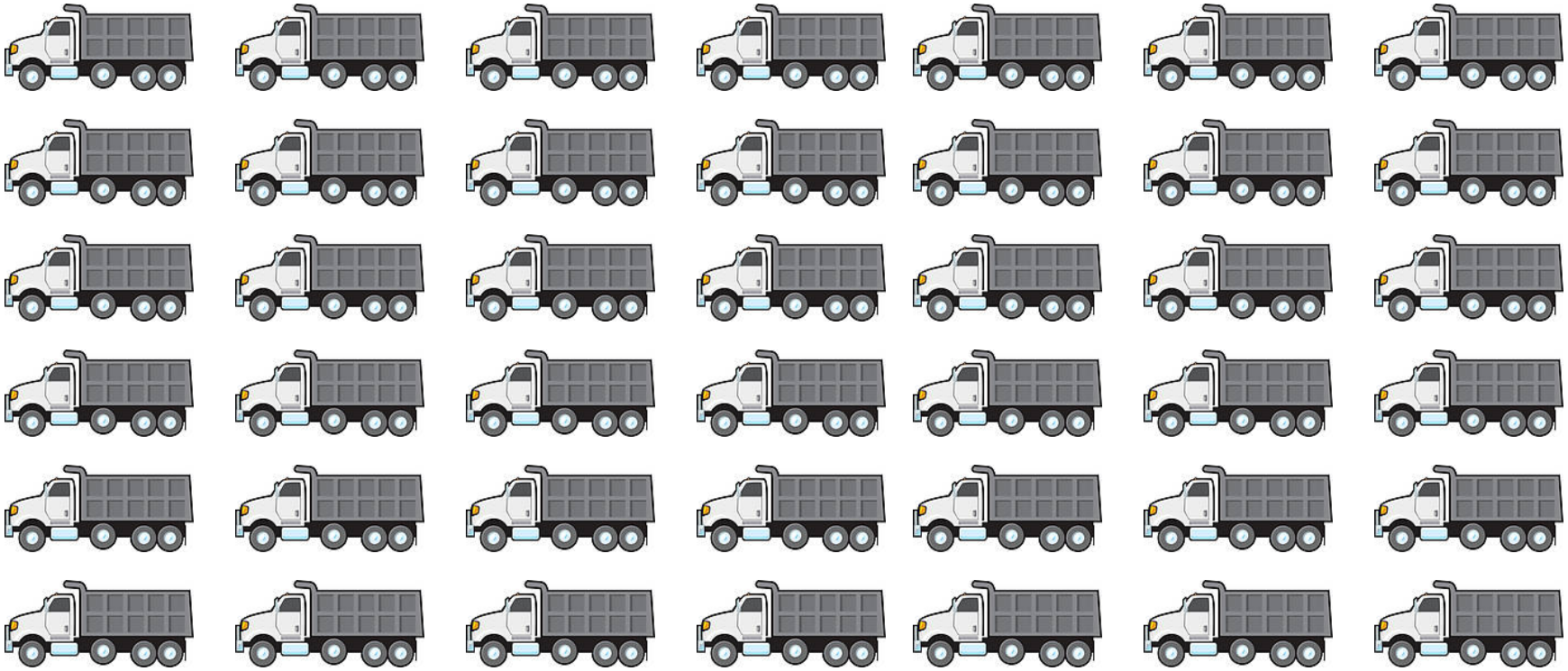
***Projection:*** *NAD 1983 Zone 19N;* ***Created by:*** *FB Environmental - 2014*

# Sediment Reduction from Roads is a Big Deal

**Soil in this area is about 0.02% Phosphorus***

**As much as 420 tons per year of sediment per year estimated to reach Province Lake**

**220 lbs of P would be found in these 42 dump trucks of soil that may reach the lake EACH YEAR!**



*(San Clements et al., 2010)

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# Towle Farm Road Pre-existing condition

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# Pre-existing structure

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# BMP Installation

# Annual Pollutant Load Reductions 2012

| | 2012-2014 Wakefield BMP Pollutant Load Reductions | | |
|---|---|---|---|
| | **TSS** | **TP** | **TN** |
| | Annual PL Removed #/year | Annual PL Removed #/year | Annual PL Removed #/year |
| | 19,000 | 96 | 107 |
| **Totals** | **38,000** | **193** | **214** |

# Rte 153 Province Lake

## CONSTRAINTS

- Road right of way
- Beach access
- Ice accumulation
- Low maintenance important

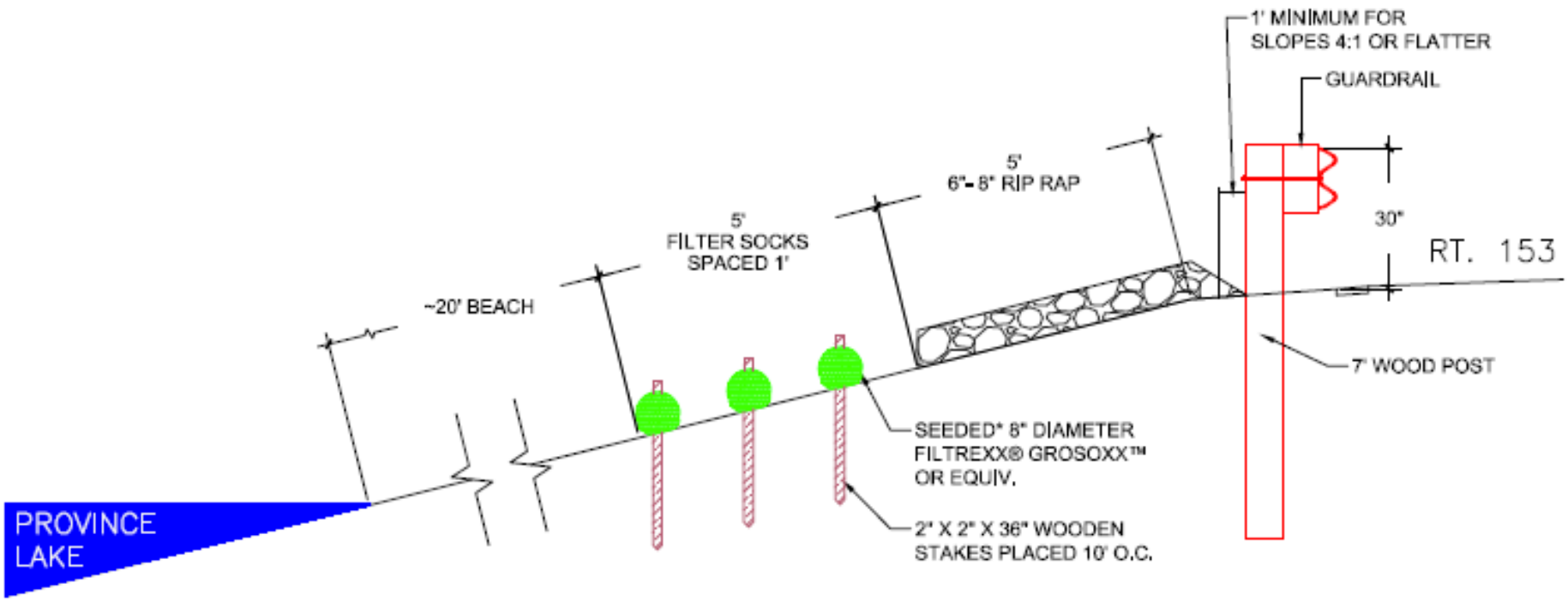
# Rte 153 Province Lake

Guardrail

Coir Log

Photo Credits: ENINE, D2 Land & Water Resource

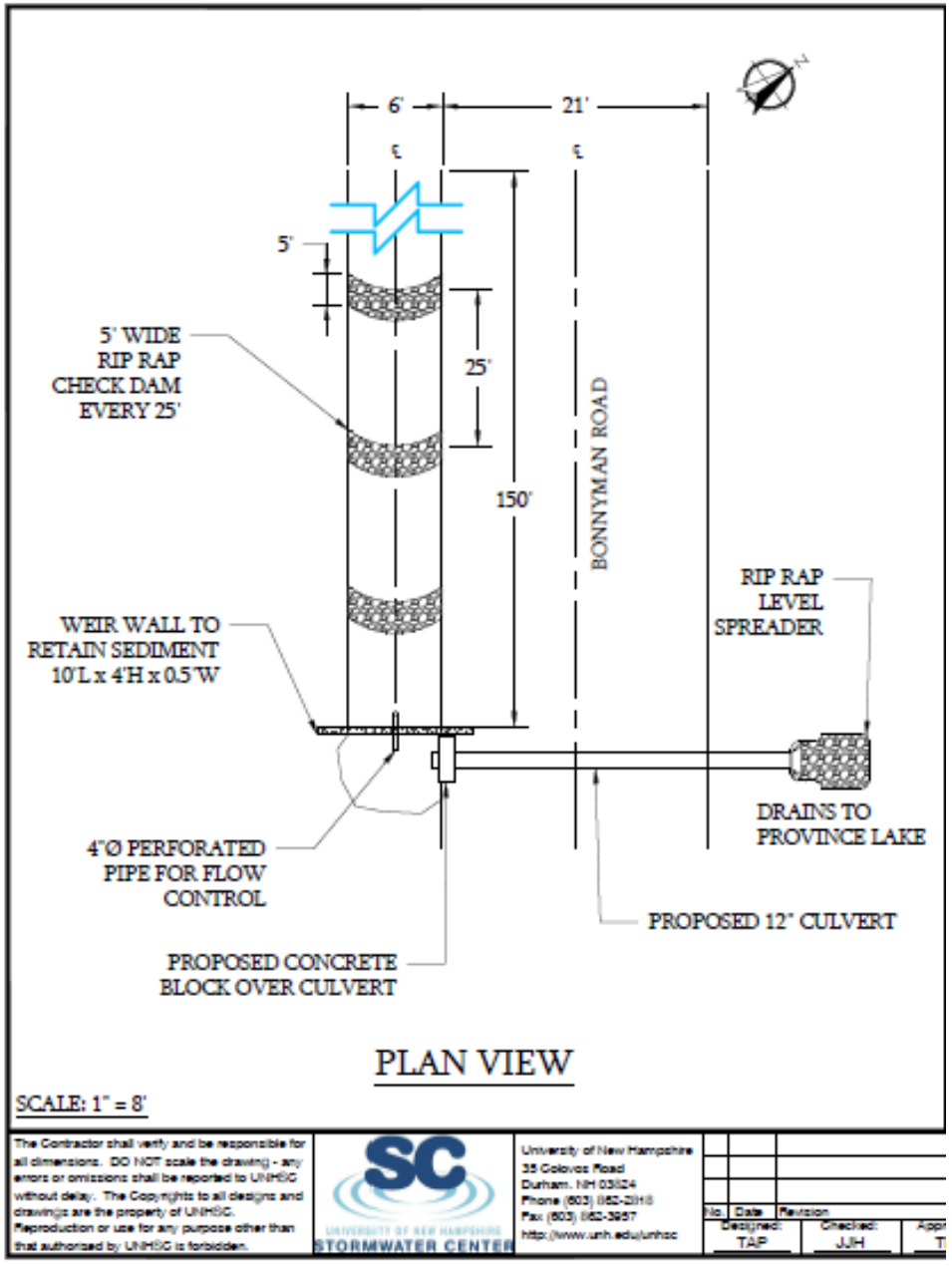
# Actual Design



# What Else Have We Learned?

# Weir walls in front of culverts?

- Rip-rap check dams every 24-50’ to reduce maintenance burdens
- Untested but prolific
- O&M plans need to be accurate and updated.



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# Questions