ALMY POND TMDL MANAGEMENT PLAN

PUBLIC WORKSHOP

Presented by:

City of Newport Department of Utilities

And

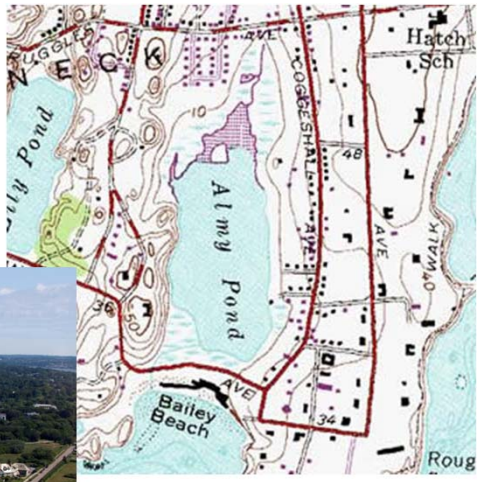
Pare Corporation

May 7, 2014

Presentation Overview

- Introduction to Almy Pond
- Project Introduction and Background
  - DEM 9 Pond Study
- Phosphorus and its Impact
- Study Outline
- Data Analysis
- Reducing Phosphorus Impairment in Almy Pond

Almy Pond



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Almy Pond Characteristics

- Pond Surface Area: 49.8 acres
- Average Water Depth: 3.9 feet
- Pond Watershed Area: 203.7 acres
- Primarily residential land use in the watershed. Sprouting Rock Beach Association located directly south.
- Primary sources of in-flow are surface water run-off directly to the Pond and run-off from City's drainage system (i.e. outfalls).
- Thirteen (13) identified storm drains discharging into Almy Pond

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2007 TMDL Study for Phosphorus to Address Nine Eutrophic Ponds in Rhode Island

- RIDEM performed a TMDL study that addresses phosphorus and phosphorus related impairments in nine ponds in Rhode Island, per Section 303(d) of the federal Clean Water Act.
- Almy Pond was reported to have the most severe nutrient impairment of any of the nine ponds studied. The most significant impairment factors were thought to be:
  - Stormwater Runoff
  - Internal Cycling
- Lesser impairment factors include:
  - Waterfowl
  - Soil erosion
  - Atmospheric deposition

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Why Almy Pond?

- Most severe nutrient impairment and mandated by the Clean Water Act
- Currently does not meet WQ Standards for a Class A Freshwater Water Body.

Class A Freshwater Water Body Definition:

"These waters are designated for primary and secondary contact recreational activities and for fish and wildlife habitat. They shall be suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses. These waters shall have excellent aesthetic value." [1]

[1]Rhode Island Department of Environmental Management Office Of Water Resources, Water Quality Regulations, Amended December 2010

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Primary Pond Functions and Values

- Almy Pond is used for secondary contact recreational activities (although public access to the pond is limited), and
- Has aesthetic value to the residents that live near the pond (although the pond is not visible from many of the surrounding roadways).

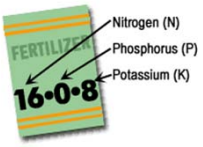
Critical Factors Not Impacted by Almy Pond

Almy Pond is classified as a Class A water body, but:

- Not a drinking water source
- Not used for primary contact recreational activities
- Not a sensitive habitat for fish or wildlife
- Isolated – Not contributing to downstream surface water bodies
- Not used for any of the other industrial/agricultural uses included in the definition

Phosphorus

- Essential nutrient for life
- Cyclic between land and water
- Identified in surface water and stormwater as:
  - Particulate-bound phosphorus
  - Dissolved phosphorus
- Typical Sources
  - Fertilizers/Pesticides
  - Animal Waste
  - Wastewater (CSO/Septic)
  - Vegetation decomposition
  - Sediment loss/exposure from land development



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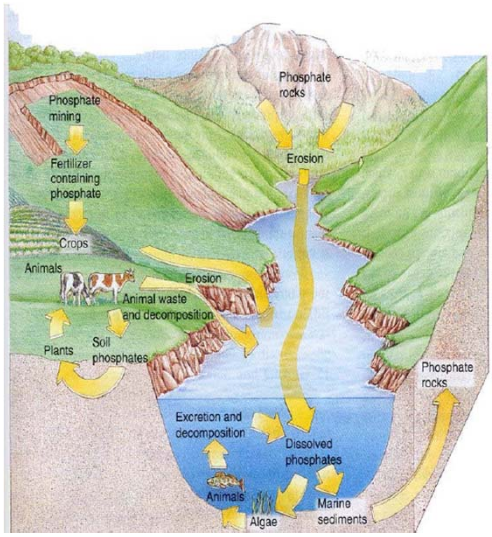
Phosphorus Cycle



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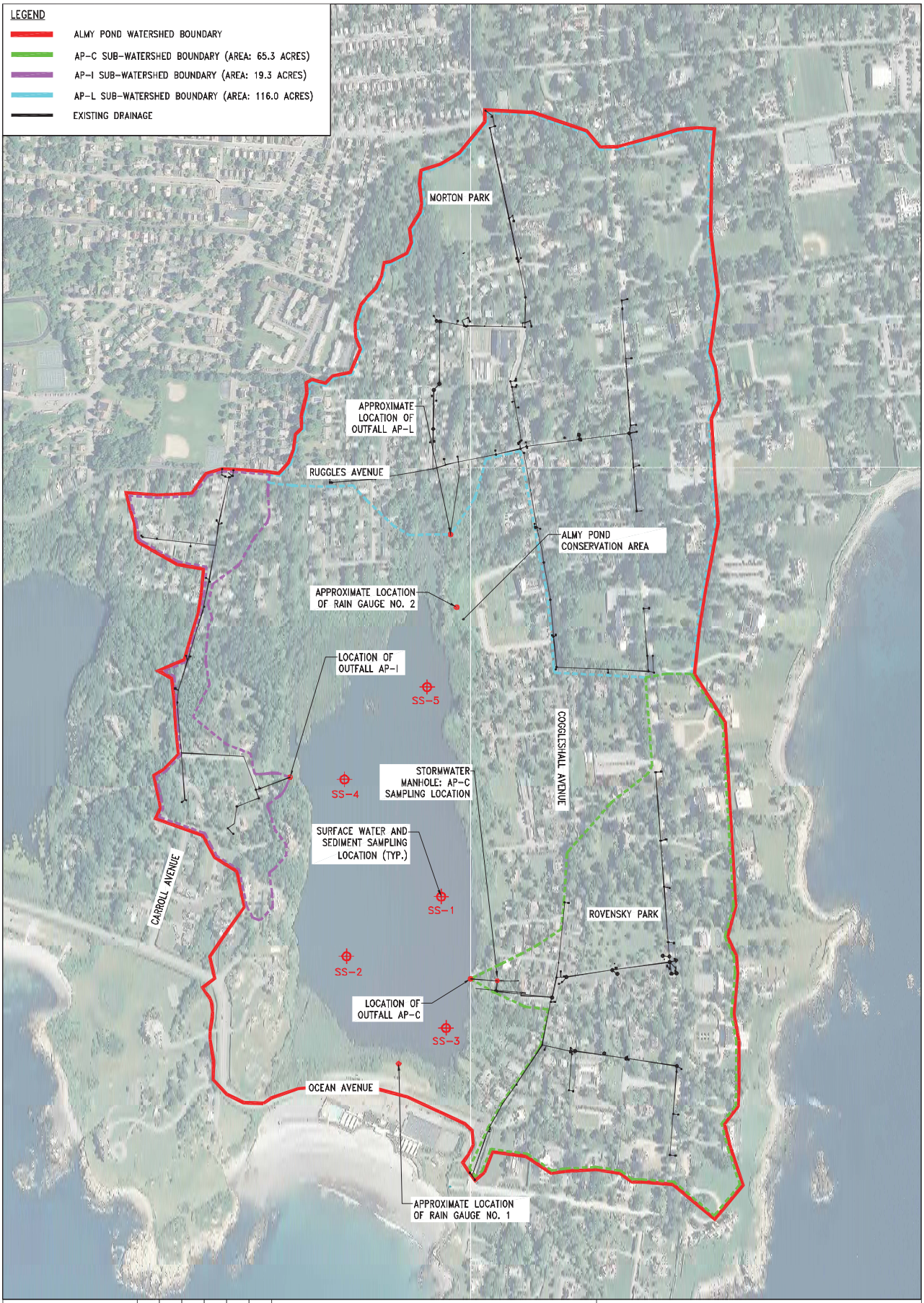
Study Overview

- Purpose of Study: Identify the primary sources of phosphorus impairment to Almy Pond
  - Existing conditions evaluation
    - Shoreline survey
    - Data collection and review
    - Source identification and characterization
  - Evaluate appropriate non-structural and structural BMPs

Field Investigation Activities

- Almy Pond shoreline survey
  - Conducted January 25, 2013
- Two stormwater sampling rounds at three (3) priority outfalls
  - Conducted March 12, 2013 and September 22, 2013
- Two surface water and pond sediment sampling rounds
  - Conducted March 29, 2013 and August 22, 2013

One of two rainfall gauges used during stormwater sampling rounds



ALMY POND TMDL MANAGEMENT PLAN

NEWPORT, RHODE ISLAND

SCALE:	NOT TO SCALE
DATE:	JANUARY 2014
PROJECT NO.:	12228.00
DESIGNED BY:	.
DRAWN BY:	MFW
CHECKED BY:	TPT

FIGURE NO.

1

PARE CORPORATION
ENGINEERS • SCIENTISTS • PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

Stormwater Sampling

Outfall AP-C (Maher Ct.)

Outfall AP-I (Alpond Dr.)

Outfall AP-L (Ruggles Ave.)

- PARE collected five samples at each outfall over the course of a target storm

**These three outfalls were selected by the RIDEM because they were identified as the largest outfalls discharging stormwater into Almy Pond.

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Surface Water and Pond Sediment Sampling

- PARE collected Pond surface water and sediment samples from five locations distributed throughout the Pond.
- In total, twenty (20) surface water samples and ten (10) sediment samples were collected over the course of both sampling rounds.

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Stormwater Sampling Laboratory Analysis

- Total Phosphorus
- Dissolved Phosphorus
- Total and Fecal Coliform
- Ammonia
- Surfactants
- Total Suspended Solids (TSS)
- Temperature
- pH
- Specific Conductivity
- Dissolved Oxygen (DO)

Surface Water and Sediment Sampling Laboratory Analysis

<u>Surface Water</u>

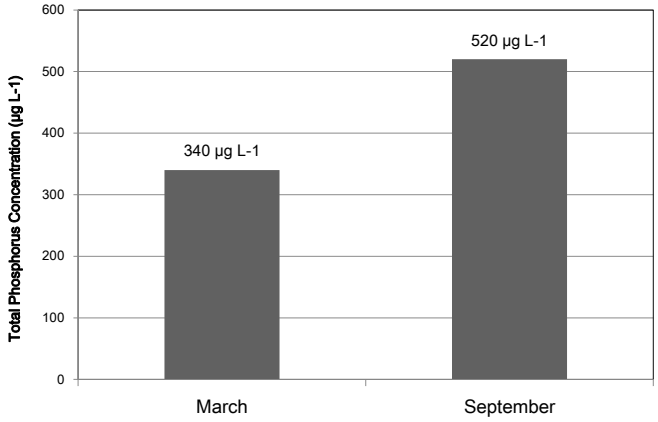
- Total Phosphorus
- Dissolved Phosphorus
- Total and Fecal Coliform
- Ammonia
- Surfactants
- TSS
- Temperature
- pH
- Specific Conductivity
- DO

<u>Pond Sediment</u>

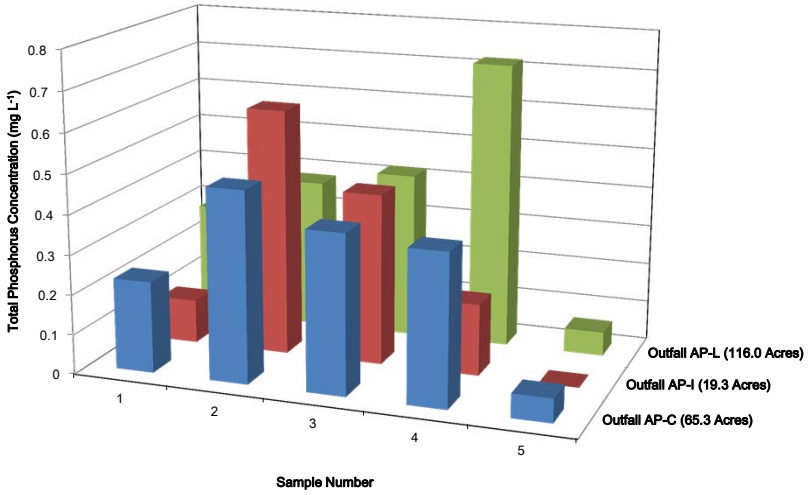
- Total Phosphorus
- Measurement of Sediment Depth

DATA ANALYSIS

Average Stormwater Total Phosphorus Concentration



March 2013 Stormwater Sampling Results



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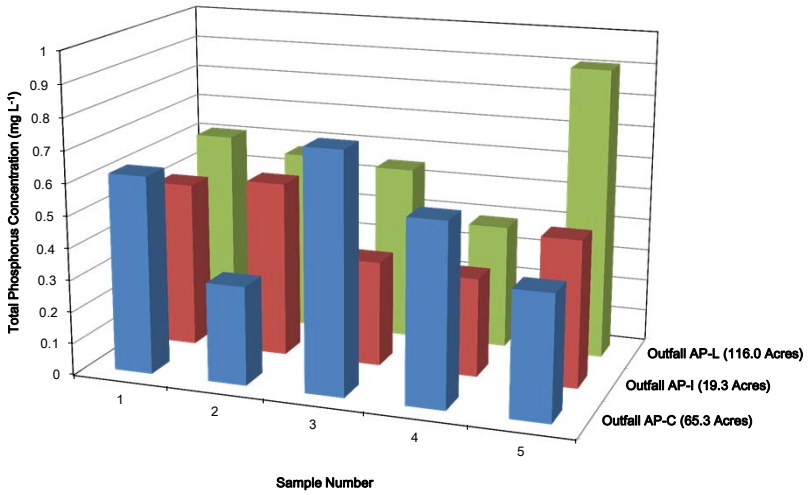
September 2013 Stormwater Sampling Results



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Stormwater Sampling Data Interpretation

- Direct correlation between rainfall intensity and phosphorus concentrations entering Almy Pond
- March sampling round depicted the “first flush” effect, which “...assumes that that the majority of pollutants in urban stormwater runoff are contained in the first half-inch to one-inch” [2]
- Outfall AP-L had significantly greater reported phosphorus concentrations, which could be attributed to the more urbanized area from which the run-off originated

[2]Rhode Island Department of Environmental Management and Coastal Resources Management Council, Rhode Island Stormwater Design and Installation Standards Manual, December 2010

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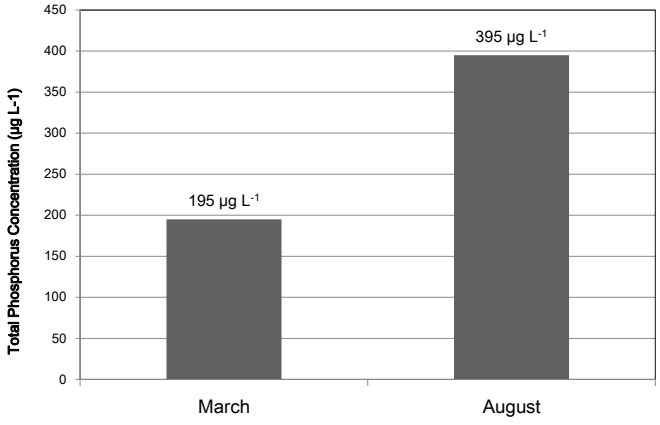
Average Surface Water Total Phosphorus Concentration



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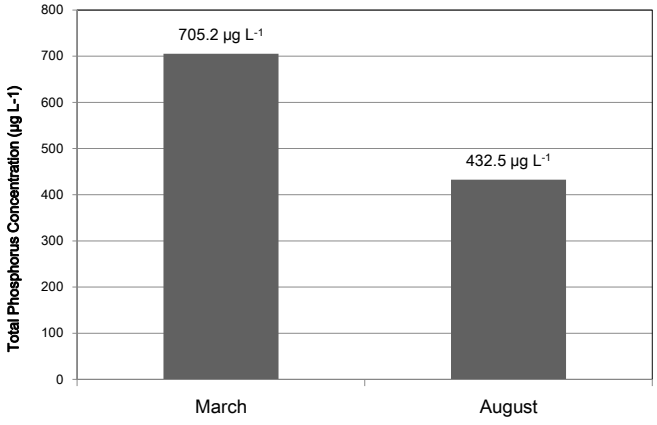
Surface Water Sampling Data Interpretation

- Increased phosphorus concentrations in the surface water during the August sampling round over March sampling round may be related to higher concentrations in runoff, higher water temperatures, and lower DO.
- The anoxic conditions and increase in Pond temperatures during the summer months alter the Pond's water chemistry, which promotes internal cycling of phosphorus from the Pond sediments to the water column

Average Pond Sediment Total Phosphorus Concentration



Sediment Sampling Data Interpretation

- Lower concentrations of phosphorus in Pond sediment reported in the August sampling round may be due to the release of phosphorus entrained in sediments from anoxic conditions at the bottom of the Pond and warmer water temperatures
- All sediment samples collected during both sampling rounds had a strong hydrogen sulfide odor, which is an indicator of anoxic conditions at the Pond sediment bed

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Data Collection Summary

- Primary sources of phosphorus: stormwater runoff and internal cycling
- Total phosphorus in Almy Pond surface water exceeds DEM regulatory level (25 µg L^{-1})
- Phosphorus in stormwater has been entering Almy Pond, settling, and accumulating within the Pond sediment over a long period of time
- Anoxic conditions exist at the bottom of Almy Pond year-round, which facilitates internal cycling

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How to Eliminate Phosphorus Impairment in Almy Pond?

- Public Outreach and Education Program
- Non-Structural BMPs (Best Management Practices)
- Structural BMPs
- Address Phosphorus Accumulation in Pond Sediment

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Public Outreach and Education Program

- Household Stormwater Management
- School Programs/Classroom Education
- City Website Development

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Public Outreach and Education Program Pros and Cons

Pros

- Relatively simple to incorporate within the watershed.
- Relatively inexpensive.

Cons

- Requires 100% public participation for effective level of phosphorus removal in stormwater runoff.
- The public will need constant reminders to stay diligent about phosphorous use.

Non-Structural BMPs

- Waterfowl Management
- Shoreline Buffer Plants
- Street Sweeping
- Catch-Basin Cleaning
- Dog Waste Stations

Non-Structural BMPs Pros and Cons

Pros

- Simple to incorporate within the watershed
- Relatively inexpensive
- Minor disturbance to the watershed
- Require only minor maintenance/upkeep.

Cons

- Requires long term commitment from the City and the public
- May require a new City ordinance to enforce required level of commitment
- Requires a strong level of public participation to be effective

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Structural BMPs

- Catch basin retrofit program
- Infiltration basins
- Sand filters
- Rain gardens
- Vegetated filter strips

Suburban Detention Basin

Rain Garden

Infiltration Trench

Structural Sand Filter

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Structural BMPs Pros and Cons

Pros

- Effective at removing external phosphorus loads in the watershed as long as there is proper commitment and enforcement to non-structural BMPs

Cons

- Limited space available in the watershed
- Most effective options generally are expensive to construct
- Must be incorporated into the City's maintenance plan, which reduces resources for other projects
- Structural BMPs may have poor aesthetic quality

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Phosphorus Accumulation in Pond Sediment Management Strategies Pros and Cons

Pros

- Most effective method of removing phosphorus concentrations within the Pond sediment and reducing internal cycling

Cons

- Very expensive to perform
- Limited space available for dewatering Pond sediments
- Chemical treatment has the potential to adversely impact water quality and the Pond's wildlife habitat
- Chemical treatment requires periodic re-application in order to have the greatest effect on the Pond
- Aeration requires permanent infrastructure (pumps, permanent power source, etc.)

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PROPOSED PHASED APPROACH TO TMDL MANAGEMENT

PARE and the City propose to monitor phosphorus reduction to Almy Pond in a phased approach:

Phase 1

Implement and study the effectiveness of the Public Outreach and Education Program over the course of 1-2 seasons

Phase 2

Implement and study the effectiveness of non-structural BMPs over the course of 1-2 seasons

Phase 3

Identify and implement the most appropriate structural-BMPs in the watershed and study their effectiveness over the course of 3-5 seasons

Phase 4

If Phase's 1 - 3 are insufficient, develop and implement a strategy for addressing phosphorus accumulation in pond sediments.

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Next Project Steps…

- Public Outreach and Awareness Program
- Coordinate with the City about implementing non-structural BMPs in the watershed.
- Identify conceptual structural BMPs that would work in this watershed.
- Prepare a TMDL Management Plan and submit to RIDEM for review and approval.

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Questions and Comments

?

Data Collection Summary

- Average stormwater total phosphorus concentration:
  - March: 340 µg L^{-1}
  - September: 520 µg L^{-1}
- Average surface water total phosphorus concentration:
  - March: 195 µg L^{-1}
  - August: 395 µg L^{-1}
- Average sediment total phosphorus concentration:
  - March: 705.2 mg kg^{-1}
  - August: 432.5 mg kg^{-1}