

Town of Hudson, NH

Robinson Pond

PREPARED FOR



Town of Hudson, NH
12 School Street, Hudson, New
Hampshire 03051

PREPARED BY



2 Bedford Farms Drive, Suite 200
Bedford, NH 03011

603.394.3904

Year 4 DRAFT -JUNE 2022

Table of Contents

1	Introduction.....	1
1.1	Summary of MS4 Permit Requirements.....	1
1.1.1	Legal Analysis.....	3
1.1.2	Funding Source Assessment.....	5
2	Existing Baseline Conditions.....	1
2.1	General Description.....	1
2.2	2011 Robinson Pond TMDL Study.....	2
2.2.1	The MS4 Permit and Lake and Pond TMDL Requirements.....	2
2.2.2	Estimated Phosphorus Loads by Source.....	2
2.2.3	TMDL Phosphorus Load Estimates.....	2
2.2.4	VHB Phosphorus Load Estimates Using the MS4 Permit Appendix F.....	3
2.2.5	Estimated Phosphorus Load Reduction Required.....	4
3	Proposed Load Reduction Measures.....	5
3.1	Stormwater Treatment Measures.....	5
	Appendices.....	
	Divider.....	

List of Tables

Table No.	Description	Page
Table 1.	Summary of Phosphorus Control Plan Action Items and Timeline to Implement	2
Table 2.	Hudson Zoning Districts & Statistics	4
Table 3.	Robinson Pond Phosphorus Loading Summary	3

List of Figures

Figure No.	Description	Page
-------------------	--------------------	-------------

No table of contents entries found.



1

Introduction

This DRAFT Phosphorus Control Plan identifies future actions that the Town will continue to evaluate and implement as funding allows to reduce phosphorus loading to Robinson Pond to comply with the NH MS4 permit requirements. This Plan also identifies the potential loading from areas that the Town has jurisdiction over and the limitations and challenges with achieving the phosphorus load reduction target as recommended in the 2011 Robinson Pond Total Maximum Daily load (TMDL) Study.

1.1 Summary of MS4 Permit Requirements

In accordance with Section 2.1.1 of the 2017 Small NH Municipal Separate Storm Sewer System (“MS4 Permit”) General Permit, municipalities which have an EPA approved lake or pond phosphorus TMDL must develop a Phosphorus Control Plan (PCP) consistent with the requirements of the MS4 Permit, Appendix F. The PCP shall identify future measures that the Town can implement to reduce stormwater related phosphorus contributions to the lake or pond and achieve the target load reduction set forth in the TMDL study to the maximum extent practicable.

Table 1 outlines the series of steps and the timeline for the municipality to complete in developing the PCP in accordance with Appendix F of the 2017 NH MS4 Permit. The written PCP is to be finalized by Year 5 of the Permit (June 30, 2023). The MS4 Permit specifies that sufficient BMPs should be in place by Permit Year 8 (June 2026) to achieve 20% of the recommended load reduction and that the total recommended load reduction should be achieved by Permit Year 15 (June 2033).

Table 1. Summary of Phosphorus Control Plan Action Items and Timeline to Implement

Action Item	Pollutant Plan Requirements	PCP Due Date
Prep for PCP Implementation	Legal analysis	PY 2
	Funding source analysis	PY 3
Illicit Discharge Data	Evaluate illicit discharge catchment mapping	PY 4
	Illicit discharge screening/monitoring results	PY 4
Define PCP Study Area & Characteristics	Define watershed area, town jurisdiction, and land use area	PY 4
	Directly connected impervious area for the target catchment	PY 4
	Define town owned land area and impervious area	PY 4
Load Calculations	Calculate baseline or existing P load	PY 4
	Determine allowable P load based on TMDL	PY 4
	Calculate P load reduction required	PY 4
Planned Non-structural BMPs	Description of planned non-structural BMPs	PY 5
	Calculate P load reduction from planned non-structural BMPs	PY 5
Existing Structural BMPs	Identify existing structural BMPs	PY 5
	Calculate P load reduction from existing structural BMPs	PY 5
Planned Structural BMPs	Identify future potential/planned structural BMPs	PY 5
	Calculate P load reduction from future structural BMPs	PY 5
	Ranking of potential structural BMPs and/or areas for BMPs	PY 5
	Feasibility assessment of planned structural BMPs	PY 5
Implementation Planning	Develop implementation schedule for all planned BMPs	PY 5
	Estimate the cost for all planned BMPs	PY 5
	Develop O&M plan for all existing and planned structural BMPs	PY 5
Implementation	Implement identified non-structural BMPs	PY 6
	Install structural BMPs and conduct performance evaluations	Meet 30% of required reduction by PY 8 (FY26) and full required reduction by PY 15 (FY33)

Abbreviations:

- › BMP = best management practice
- › MS4 = Municipal Separate Storm Sewer System
- › N = nitrogen
- › NSIR = nutrient source identification report
- › P = phosphorus
- › PCP = phosphorus control plan
- › PY = permit year

1.1.1 Legal Analysis

Permit Requirement: The permittee shall conduct an analysis to identify the existing regulatory mechanisms available to the municipality such as by-laws and ordinances to minimize phosphorus loading from public and private property and describe any planned changes to these regulatory mechanisms that may be necessary to effectively implement the PCP. This may include the creation or amendment of financial and regulatory authorities. The permittee shall adopt any identified regulatory changes by the end of the permit term.

In 2020, the Town of Hudson Planning Board updated their Chapter 290 Stormwater Management regulations to require enhanced stormwater treatment for new and redevelopment projects that disturb more than 40,000 square feet area consistent with the 2017 NH MS4 Permit. This includes new residential subdivisions or newly proposed or redeveloped commercial or multifamily residential properties subject to the Site Plan and Subdivision approval.¹

The updated regulations require new development projects that will disturb 40,000 square feet or more incorporate stormwater treatment BMPs that have rated pollutant removal efficiencies of 80% and 50% for Total Suspended Solids (TSS) and Total Phosphorus (TP), respectively, for the total post-construction impervious area. For redevelopment, these projects must treat at least 30% of the existing impervious cover and 50% of any new impervious cover with stormwater BMPs. While the new regulations are expected to require considerable treatment for new impervious area, equally as important, redevelopment projects could potentially reduce existing pollutant loads to Robinson Pond. However, with much of the developed areas in the watershed consisting of single-family residential homes, the opportunities for redevelopment projects in the watershed are likely limited.

Smaller new and redevelopment projects that are expected to disturb more than 20,000 sq. ft but less than 40,000 sq. ft. of area, are required to include Low Impact Development (LID) measures, to the maximum extent practical. The minimum lot size requirements for the various zoning districts as defined in the Town Code Article IV. Zoning are summarized in Table 2 below.

¹ Post-Construction Stormwater Management Standards for New and Redevelopment, Town of Hudson Chapter 290 §290-5 (2020). <https://ecode360.com/14425780>

Table 2. Hudson Zoning Districts & Statistics

District (abbreviation)	Brief Description	Proportion of Town Area	Minimum Lot Area (sq. ft.)	
			With Water & Sewer	Without Water & Sewer
Residential – One (R-1)	Single family residential dwellings	1,622 acres (8.7%)	30,000	43,560
Residential – Two (R-2)	Single family or duplex dwellings	4,371 acres (23.5%)	43,560	60,000 (43,560 if single family)
Town Residential (TR)	Historic residential areas established prior to zoning	895 acres (4.8%)	10,000	10,000
Business (B)	General wholesale & retail commercial uses, multi-family residential dwellings	792 acres (4.3%)	30,000	43,560
Industrial (I)	Nonresidential industrial development, warehousing, business, and commercial uses	1,100 acres (5.9%)	30,000	43,560
General (G)	All areas not included in the Districts defined above & may allow any uses	2,717 acres (14.6%)	43,560	43,560
General – One (G-1)	Same allowed uses as General but outside Circumferential Highway right- of-way	7,060 acres (37.9%)	87,120	87,120

Sources: <https://ecode360.com/14358502>

<https://ecode360.com/attachment/HU1110/HU1110-334d%20Table%20of%20Minimum%20Dim%20Req.pdf>

https://www.hudsonnh.gov/sites/default/files/fileattachments/zoning/code_enforcement/page/2061/cdd-zn-map.pdf

The New Hampshire Shoreland Water Quality Protection Act (SWQPA) establishes minimum standards for development in the protected shoreland area, which is defined as 250 feet inland of the water body reference line. The Act applies to all lakes and ponds greater than 10 acres, all 4th order and greater streams and rivers, most designated rivers which may include sections of less than 4th order, and all tidal waters. At a minimum, primary structures must be set back 50 feet from the reference line and accessory structures set back 25 feet. Municipalities throughout the state may impose more stringent rules regarding setbacks and vegetation removal within the protected shoreland area, but no municipal ordinance may be less restrictive than this Act.²

The Town of Hudson has established a Wetland Conservation District which includes all surface waters, wetlands of any size, and a 50-foot wide buffer around wetlands and surface waters.³ The only uses expressly permitted within this District are:

1. Forest management consistent with best management practices,
2. Agriculture consistent with best management practices,
3. Passive recreation such as hiking, fishing, hunting, and non-motorized boating,
4. Wildlife or fisheries management,
5. Water supply wells,
6. Rehabilitation, repair, or replacement of stormwater management facilities or other structures which lawfully existed prior to March 11, 2020.

² Shoreland Water Quality Protection Act, NH RSA ch. 483-B (1991). <http://www.gencourt.state.nh.us/rsa/html/L/483-B/483-B-mrg.htm>

³ Uses within Wetland Conservation District, Town of Hudson Article IX §334-36 (1995). <https://ecode360.com/14358563>

These regulations do specifically prohibit certain activities such as salt storage, solid or hazardous waste facilities, use of lawn fertilizer, excavations, and underground tanks. However, other uses may be allowed if granted a Conditional Use Permit by the town Planning Board.

1.1.2 Funding Source Assessment

Permit Requirement: The permittee shall estimate the cost for implementing its PCP and describe known and anticipated funding mechanisms. The permittee shall describe the steps it will take to implement its funding plan. This may include but is not limited to: conceptual development, outreach to affected parties, and development of legal authorities to collect and administer funds.

The Town's primary source of funding to support municipal services and maintain its existing road, drainage, and facility infrastructure is through annual property taxes, except for water and sewer services which are funded through user fees assessed through dedicated enterprise funds. Maintenance of the Town's roadways and associated stormwater drainage infrastructure are funded through the Department of Public Works (DPW) annual operating budget while the Town's capital improvement plan is used to allocate funds for larger expenditures typically associated with vehicle replacement or purchases, other equipment, or major facility improvements and acquisitions.

The Town has adopted an Impact Fee Ordinance which allows the Planning Board to impose Impact Fees on major development and roadway improvement projects that will adversely impact the future capacity and usage of Town facilities and assets. The impact fee is used to fund future Town facility capacity expansions and improvements that will likely be needed because of the proposed development. These improvements typically include road widenings, additional turning lanes, and related traffic control systems such as lights or signage as well as expanding municipal service facilities or vehicle fleets. Depending on the development, impact fees can also be used to expand the capacity and improve recreation facilities.

Robinson Pond represents a major recreational asset for Town residents and is used for swimming, boating, fishing, and other water related recreational activities. The Town owns and maintains a small beach area that is frequently visited during the summer months. The watershed area is nearly at full build-out conditions with minimal available undeveloped land for future development. Additional analyses would be required to assess whether any existing recreational or transportation related impact fees could be used to enhance the capacity and useability of Robinson Pond through measures designed to improve water quality conditions.

Future control measures could also be funded through the Town's capital improvement planning process especially for planned structural improvements designed to treat stormwater runoff from Town-owned property.

The Nashua Regional Planning Commission (NRPC) continues to provide technical assistance to the Town, especially in efforts related to Robinson Pond. In December 2000 the NRPC received under an EPA 604(b) Watershed Planning Grant a to develop a Water Quality Protection Plan for Robinson Pond. The goal of this plan will be to identify best management practices which may improve water quality in the Pond.

Another source of low-cost financial assistance relates to the state's **Clean Water State Revolving Fund** (CWSRF) administered by the NH Department of Environmental Services (NHDES). This program provides low-interest loans with some principal forgiveness for eligible planning, design, and construction projects to stormwater and water quality improvement projects, especially those

designed to enhance conditions in impaired water bodies. The annual project application process generally occurs in early spring (late March to May) and project awards are typically decided by mid to late June. In recent years, NHDES has granted principal forgiveness of up to \$75,000 for most projects. The interest rate on any outstanding loan balance has been at around 2 percent. The Town should consider use of this program to finance any future stormwater treatment project or even a targeted public education campaign in the Robinson Pond watershed.

Existing Baseline Conditions

2.1 General Description

Robinson Pond is approximately 130 acres in size with a maximum depth of 29.5 feet and an average depth of 8.0 feet. Robinson Pond is a widely used recreational resource that supports swimming, boating, and fishing activities. The Town has its own recreational beach that is actively used throughout the summer. The Pond watershed area is comprised of approximately 1,250 acres and is largely contained within the Town of Hudson, although the northeastern most section of the watershed extends into the Town of Londonderry.

Robinson Pond, like many other lakes and ponds in southern New Hampshire, is classified as eutrophic, which means it is generally nutrient rich, and usually has low water transparency or clarity, abundant aquatic vegetation, and low levels of dissolved oxygen at depth. The pace of eutrophication can accelerate with increased development within the watershed. Increased development introduces other sources of nutrients such as lawn fertilizer, septic tanks, pet waste, sediment erosion, and increased delivery via stormwater runoff from impervious surfaces. As a result, phosphorus levels such as in Robinson Pond will continue to increase unless proactive measures are taken.

In the most recent 2020/2022 Section 303(d) list published by NHDES, Robinson Pond (AUID: NHLAK700061203-06-01) is included as being impaired for Primary Contact Recreation due to Chlorophyll-a (Chl-a), cyanobacteria, and *E. Coli*. The Pond is also listed as impaired for Aquatic Life Integrity due to Chl-a, dissolved oxygen saturation, non-native aquatic plants, pH, and total phosphorus. The Robinson Pond Town Beach (AUID: NHLAK700061203-06-02) is also listed due to dissolved oxygen saturation, pH, cyanobacteria, and *E. Coli*.

The impairments observed in Robinson Pond are typically the result of nutrient enrichment, specifically high levels of total phosphorus. Thus, significant reduction in the total phosphorus levels would improve conditions related to dissolved oxygen and Chl-a and would help to support the designated uses for Robinson Pond. Total phosphorus enters the lake from precipitation, storm water runoff, and ground water flow. Land use changes can affect the amount of phosphorus contributed from different areas within the watershed. The Robinson Pond watershed consists of 5 sub-watersheds that includes Launch Brook, Howard Brook, Juniper Brook, Robinson Road Direct Drainage, and Direct Drainage and two emergent wetlands known as the Northern Cove and Southern wetlands.

Approximately 40% of the land area within the watershed area is developed, primarily as single-family homes. Approximately 75% of the watershed around the northerly, easterly, and southerly side of the lake is zoned as residential use within the General (G-1). The western side of the lake is zoned as a Residential R-1 zone. The minimum lot size in the R-1 and G-1 zones are 1 acre (43,560 sq. ft) and 2 acres (87,120 sq. ft.), respectively. According to the Town of Hudson's sewer service area, municipal wastewater utilities are not available for properties within the Robinson Pond watershed, and thus, homes must rely on private wastewater disposal systems.

2.2 2011 Robinson Pond TMDL Study

2.2.1 The MS4 Permit and Lake and Pond TMDL Requirements

The Robinson Pond Phosphorus Total Maximum Daily Load (TMDL) study is one of 16 TMDL studies that were completed in New Hampshire in 2011 and were funded by the US EPA. The intent of a TMDL is to evaluate and quantify the source contributions in lakes and ponds that show symptoms of excessive nutrient inputs, to recommend best practices that will restore water quality conditions and improve the recreational and aquatic life uses in these lakes and ponds. These TMDL studies have now become part of the 2017 NH MS4 Permit, which requires certain load reduction targets be achieved over a 15-year time frame extending out to 2033. The 2017 MS4 Permit requires that the Town adopt measures to achieve an interim 30% load reduction target by Permit Year 8 or Fiscal Year 2026.

2.2.2 Estimated Phosphorus Loads by Source

Phosphorus is contributed from various sources including atmospheric deposition (rainfall), stormwater runoff from impervious surfaces, fertilizer usage, pet waste and livestock manure, improperly sized, maintained, or sited septic systems in the near shore area, wildlife (waterfowl and beaver), and internal loading. Internal loading refers to the release of phosphorus from deposited sediments on the lake floor typically under a low dissolved oxygen or anoxic environment. The amount of internal loading that may occur depends on the length of time water in the bottom layer thermally stratifies from upper water setting up low oxygen conditions. External loading from the surrounding watershed area occurs as a result of human activities that introduce nutrient imports or land use conversions that allow more effective delivery of phosphorus to the lake via increased stormwater runoff. Wildlife, such as waterfowl and beaver, are known to be present within the Robinson Pond watershed and surrounding brooks and contribute to the annual total phosphorus load within the watershed.

2.2.3 TMDL Phosphorus Load Estimates

The 2011 Robinson Pond TMDL Study estimated the average annual phosphorus load to the Pond using the ENSR-LRM methodology, which is a model developed by AECOM and modified for New Hampshire by adding phosphorus export coefficients New Hampshire specific land uses and by including septic system loading. The Robinson Pond watershed was divided into five subwatershed areas based on tributaries and topography. Phosphorus load was then estimated for each watershed as well as atmospheric, internal, waterfowl, and septic system loading.

Table 3 provides a breakdown of the estimated total phosphorus loads by source or watershed area draining to Robinson Pond as developed by the 2011 TMDL Study, which amounts to 115.2 kg/year or 254 lbs./year. The estimated phosphorus from the watershed .area accounts for 85% of the estimated annual total phosphorus load or 97.4 Kg/yr. (215 lbs./yr) that drain while another approximately 8% of the estimated load was assumed to be contributed from direct atmospheric deposition to the lake, 2% was estimated to be contributed from internal loading, of bottom sediments and 3% was estimated to be contributed from shoreline septic systems, and 2% was estimated to be contributed from wildlife.

Table 3. 2011 Robinson Pond TMDL Phosphorus Loading Summary

Estimated TP Inputs by Source/ Drainage Area	TMDL TP Load Estimates		% of Total Load
	(kg/year)	(lbs./year)	
Atmospheric	8.9	19.6	8
Internal	2.3	5.1	2
Wildlife	2.8	6.2	2
Septic System	3.8	8.4	3
Watershed Loads			
Launch Brook	30.4	67.0	26
Howard Brook	18.3	40.4	16
Direct Drainage	36.0	79.4	31
Direct Drainage near Juniper	8.5	18.7	7
Direct Drainage near Robinson Rd	3.6	7.9	3
North Wetland	0.3	0.7	<1
South Wetland	0.3	0.7	<1
Total	115.2	254.0	100

Source: Total Maximum Daily Load for Robinson Pond, Hudson, NH. January 2011.

According to the 2011 TMDL study, a total phosphorus load of approximately 8.4 lbs./yr was estimated to be contributed from 21 homes identified as using septic systems within 125 feet of the Robinson Pond. This translates to approximately 0.4 lbs./yr. per home. Septic systems in near shore areas have a greater risk of conveying phosphorus via groundwater to the pond. In New Hampshire, to minimize this risk of phosphorus contributions, many communities have adopted a setback limit of 125 feet for septic systems from the shoreline of surface waters, including tributaries.

2.2.4 VHB Phosphorus Load Estimates Using the MS4 Permit Appendix F

Using phosphorus load export rates included in Appendix F of the 2017 MS4 Permit, VHB developed a revised estimate of the average annual watershed load of approximately 170 lbs./year for Robinson Pond. This estimate is also based more recent GIS based land use data contained in the NHGRANIT data library. This revised estimate is based on a watershed area of approximately 1,256 acres and includes the estimated 80 acres located in the Town of Londonderry. The revised phosphorus load estimate is approximately 20% or 45 lbs./year less than the watershed load estimate included in the 2011 TMDL study. This may reflect differences in the inherent assumptions involved with the fate and transport of phosphorus from the various sources between the two modeling approaches.

The revised estimate also does not include the estimated 34.0 lbs./year associated with direct inputs of phosphorus to the pond from atmospheric deposition, waterfowl, near shore septic systems and internal loading from bottom sediments that were included in the 2011 TMDL Study.

Table 4 provides a breakdown of the revised pollutant load estimates for each of the major catchment areas in the watershed similar to those listed in the TMDL Study.

Table 4. Robinson Pond Preliminary Phosphorus Loading Estimates By Catchment Area¹

Catchment Area	Land Area (acres)	Impervious Cover Area (acres)	Est. Phosphorus Load (lbs./year)	% of Estimated Total Load
Launch Brook	241	25.4	36.6	22%
Launch Brook (Londonderry)	80	9.0	14.2	8%
Subtotal	321	34.4	50.8	30%
Direct Drainage1	25	3.8	3.2	2%
Direct Drainage2	198	23.1	27.4	16%
Direct Drainage3	159	8.8	21.2	12%
Subtotal	382	35.7	51.8	31%
Howard Brook_	335	25.1	43.5	26%
Juniper Brook Direct Drainage	128	13.8	17.9	11%
Robinson Rd Direct Drainage	49	5.4	5.2	3%
North Wetland	21	0.00	0.3	0%
South Wetland	20	0.02	0.2	0%
Total	1,256	114	170	100%

Notes: ¹ These P load estimates are based on preliminary data and are subject to change with new information that may be collected in future years.

2.2.5 Estimated Phosphorus Load Reduction Required

The 2011 TMDL Study suggested that the estimated overall average annual phosphorus load would need to be reduced by approximately 40% to lower the average in-lake phosphorus concentration to 12 µg/L, which represents an average in-lake concentration for New Hampshire mesotrophic lakes as opposed to eutrophic lakes based on NHDES lake data. This suggested lower average annual phosphorus concentration would likely result in a noticeable decrease in the nuisance algal blooms and an improvement in low dissolved oxygen conditions. If just the watershed load is included, the TMDL study suggests that a 48% reduction in the estimated watershed load would be needed to lower the in-lake concentration to the target level.

Based on the revised watershed load estimate of 170 lbs. P/yr., and if we exclude the estimated 9.0 lbs./yr. contributed from the Londonderry portion of the watershed, a 48% reduction in the estimated watershed load would be equivalent to eliminating approximately 75 lbs./yr. from the watershed load. This will require a wide range of nutrient reduction measures for both municipal and privately-owned properties to achieve this reduction goal. In fact, the feasibility of achieving this reduction goal will depend greatly how much of the estimated load is associated with Town-owned land and other sources that can be feasibly managed by stormwater treatment measures implemented over time. Assuming an average annual removal efficiency of approximately 50% for most stormwater treatment measures and an estimated average phosphorus load rate of approximately 1.96 lbs./ac./yr. for roadway areas in medium residentially developed areas (Table 2.1 of Attachment 2 of Appendix F), approximately 73 acres of road impervious areas would need to be treated by a stormwater BMP.

Certain land areas and phosphorus loads may be easier to treat or control more than others. An evaluation of potential phosphorus control measures will be conducted in Year 5 consistent with MS4 Permit requirements and the results of this evaluation will be included in this Report.

3

Proposed Load Reduction Measures

3.1 Stormwater Treatment Measures

To be completed in Permit Year 5 or in 2023

Divider

This page intentionally left blank.



A

Appendix_Heading 1

Appendix_Heading 2

Appendix_Heading 3

Appendix_Heading 4

Appendix_Heading 5

Table A1 Appendix_Table_Title

Figure A1 Appendix_Figure_Title

This page intentionally left blank.