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March 17, 2025

MEMO

To: Christy Witters, Sam Hughes, and Emily Schelley
Vermont DEC Stormwater Program

From: Amy Macrellis, Stone Environmental
Jenn Callahan, Vermont Agency of Transportation

Stone Project No. 20231008
Subject: Lake Champlain Basin Phosphorus Control Plan, Vermont Agency of Transportation – Progress Report

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On behalf of VTrans and in accordance with *NPDES General Permit 3-9007 for Stormwater Discharges from the State Transportation Separate Storm Sewer System (TS4)* Section 9.2.D, Stone is pleased to submit this Progress Report summarizing actions taken to implement all Phosphorus Control Plan (PCP) components. This submittal includes a progress report on crediting for impervious and pervious acres managed, and BMPs implemented, through December 31, 2023 and provides updates to estimated extent of completion for remaining items and schedule as of December 31, 2024.

1. Extent of BMP implementation

In the last progress report (submitted October 22, 2023), documentation of historic and current operations, and projection of current operations through the term of the first VTrans Phosphorus Control Implementation Plan (PCIP)[1] (submitted October 1, 2020) was updated in the implementation model to account for capital projects and maintenance activities completed through December 31, 2022. Plan review, maintenance activity review, and culvert and swale inventory review and crediting activities for reductions achieved by VTrans between Jan. 1 and December 31, 2023 were completed in calendar 2024 in tandem with preparation of the second VTrans Lake Champlain Basin PCIP[2] (submitted October 1, 2024). A provisional draft of the progress submittal for structural and non-structural measures accomplished from January 1-December 31, 2023 was included in Appendix A of the Phase 2 PCIP.

Figure 1 below compares progress documented through December 31, 2023 and projected through the term of the Phase 1 PCIP with the Phase 1 target P reduction. At the end of 2022, a cumulative P load reduction of 347.2 kg/yr was documented for structural road drainage and localized erosion repair practices. In 2023, maintenance operations and constructed capital projects achieved an additional 95.14 kg/yr P load reduction for structural practices for a cumulative P load reduction of 442.3 kg/yr. Annual acres managed and P load

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[1] https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/TS4/VTrans PC Implementation Plan_2020 10 01_2021 03 12.pdf
[2] https://anrweb.vt.gov/PubDocs/DEC/Stormwater/Permits/7892-9007.A8.pdf

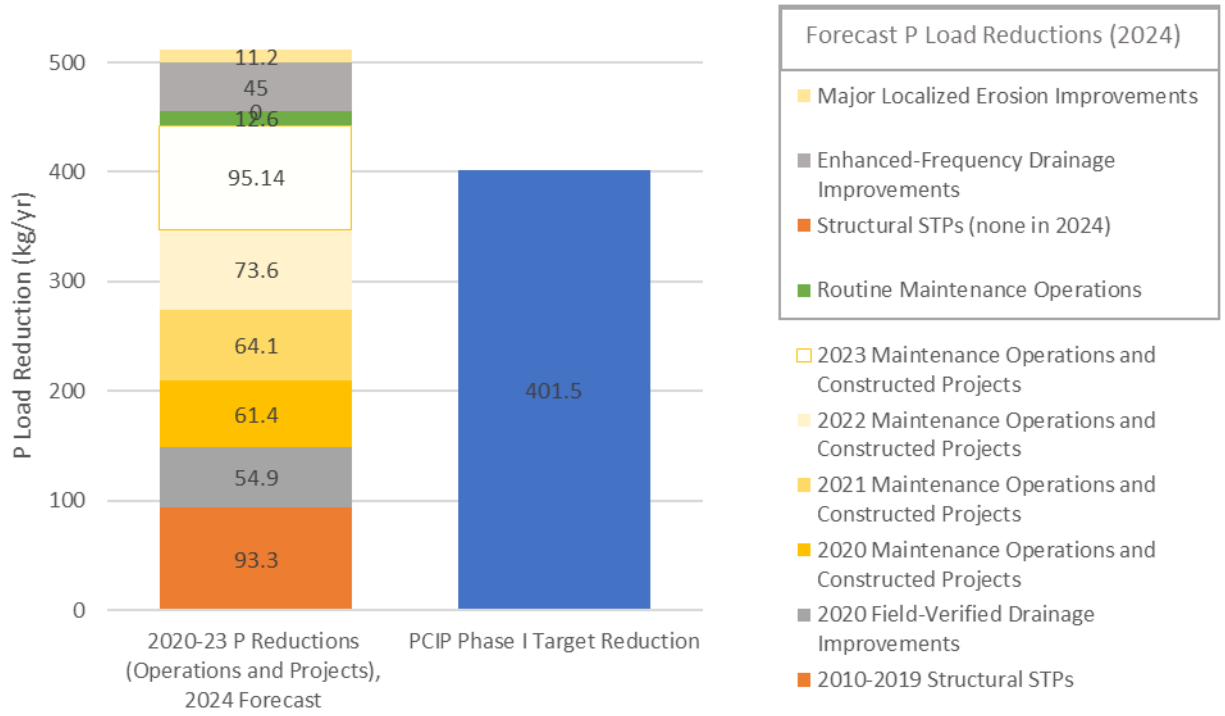


Figure 1. Summary of Phase 1 progress toward target P load reduction for structural BMPs only, summarizing progress documented through December 31, 2023.

reduction credited for non-structural practices in 2023 represented an additional 1,549 impervious acres and 8.4 kg/yr.

Below, we briefly summarize activities undertaken in calendar 2024 and P reductions documented in calendar 2023, organized by the suite of necessary BMPs set forth in the PCIPs.

1.1 Tracking and Accounting

VTrans continued implementation of a tracking and accounting system, working to integrate with and build from its asset inventories and the Vermont Asset Management Information System (VAMIS). TS4 swale asset re-inventory utilizing the refined TS4 ditch inventory for features located within the LCB continued in the 2024 field season. TS4 swales west of VT Route 100 in the northern portion of the LCB were re-inventoried, as well as substantial portions of the swales south of Chittenden County - constituting 10,492 of 25,708 (41%) of the mapped swales in the LCB (see Attachment 1 for a map of re-inventoried swale extents).

1.2 Structural Correction of Road Drainage Deficiencies

Correction of road drainage deficiencies, as documented automated capture of improvements tracked in Small Culvert Inventory, TS4 Swale Inventory, and Short Structures Inventory datasets; in MATS; and in

programmed capital projects during calendar 2023 were summarized and credited in the implementation model. Paved roads areas managed via structural correction of road drainage asset deficiencies are summarized in Table 1, while P load reductions achieved are summarized in Table 2. These improvements are further summarized in Figure 1 and in the implementation model (Table 6).

Table 1. Summary of paved road impervious acres managed for road drainage asset repairs implemented in 2023

		Paved Roads Acres Managed by Crediting Mechanism			
Lake Segment	SWAT Drainage Area	Asset Inventory Capture	Maintenance Activities (MATS)	Major (Programmed) Projects	Total
1-South Lake B	Mettawee River	3.68			3.68
	Poultney River		0.90	0.19	1.09
2-South Lake A	South Lake A - DD	1.10			1.10
4-Otter Creek	Little Otter Creek	0.90		0.17	1.07
	Otter Creek	11.14	5.91	1.23	18.29
5-Main Lake	Winooski River	42.98	6.23	1.19	50.40
6-Shelburne Bay	LaPlatte River	0.46	0.39		0.85
8-Malletts Bay	Lamoille River	11.63	28.79	0.38	40.80
9-Northeast Arm	Northeast Arm - DD			1.56	1.56
10-St. Albans Bay	St. Albans Bay - DD	0.58			0.58
11-Missisquoi Bay	Missisquoi River	5.48	0.93	0.24	6.65
	Missisquoi Bay - DD	0.29	3.93		4.22
12 - Isle La Motte	Isle La Motte - DD		0.54		0.54
TOTAL		78.25	47.62	4.96	130.83

Table 2. Summary of P load reductions (kg/yr) documented for road drainage asset repairs implemented in 2023

		P Load Reductions (kg/yr) by Crediting Mechanism			
Lake Segment	SWAT Drainage Area	Asset Inventory Capture	Maintenance Activities (MATS)	Major (Programmed) Projects	Total
1-South Lake B	Mettawee River	2.03			2.03
	Poultney River		0.18	0.12	0.31
2-South Lake A	South Lake A - DD	0.48			0.48
4-Otter Creek	Little Otter Creek	0.52		0.11	0.62
	Otter Creek	5.92	3.25	0.95	10.12
5-Main Lake	Winooski River	21.98	2.43	0.46	24.87
6-Shelburne Bay	LaPlatte River	0.18	0.31		0.49
8-Malletts Bay	Lamoille River	6.78	18.86	0.26	25.89
9-Northeast Arm	Northeast Arm - DD			0.58	0.58
10-St. Albans Bay	St. Albans Bay - DD	0.26			0.26
11-Missisquoi Bay	Missisquoi River	0.24	0.50	0.10	0.84
	Missisquoi Bay - DD	3.49	1.57		5.06
12 - Isle La Motte	Isle La Motte - DD		0.23		0.23
TOTAL		41.88	27.33	2.57	71.79

1.3 Structural Correction of Road Erosion Issues

Correction of minor areas of localized erosion as documented in MATS and in programmed capital projects during calendar 2023 were summarized and credited in the implementation model (Table 3, Table 6, and Figure 1).

Table 3. Summary of paved roads acres managed and P load reductions (kg/yr) for localized erosion repairs implemented in 2023

		Paved Roads Acres Managed		P Load Reduction (kg/yr)	
Lake Segment	SWAT Drainage Area	Maintenance (MATS)	Major Project	Maintenance (MATS)	Major Project
1-South Lake B	Poultney River	4.71		1.04	
2-South Lake A	South Lake A-Direct Drainage	3.80		1.26	
4-Otter Creek	Otter Creek	11.54	2.06	1.88	0.64
5-Main Lake	Winooski River	10.26		1.10	
6-Shelburne Bay	LaPlatte River	0.48		0.06	
8-Malletts Bay	Lamoille River	8.32	0.79	1.58	0.12
11-Missisquoi Bay	Missisquoi River	9.17		1.72	
	Missisquoi Bay-Direct Drainage	0.57		0.04	
TOTAL		48.85	2.85	8.67	0.76

Several areas of culvert outlet gully erosion were corrected in 2023. These stabilization measures were also summarized and credited in the implementation model (Table 4, Table 7, and Figure 1).

Table 4. Summary of culvert outlet gully stabilization activities and P load reductions (kg/yr) in 2023

Lake Segment	SWAT Drainage Area	Extent of Remediation	Cubic Feet of Gully Erosion Restored	P Load Reduction (kg/yr)
4-Otter Creek	Otter Creek	Partially Restored	200	0.13
5-Main Lake	Winooski River	Fully Restored	10,360	8.43
8-Malletts Bay	Lamoille River	Partially Restored	10.8	0.02
	Malletts Bay Direct Drainage	Partially Restored	6,944	1.31
	Lamoille River	Fully Restored	599	0.80
11-Missisquoi Bay	Missisquoi River	Fully Restored	51.3	0.65
TOTAL			18,165	11.34

1.4 Non-Structural Controls

Lane miles swept and drop inlets (DIs) cleaned in 2023 were summarized and credited in the implementation model (Table 5). No Vactor contracts were executed in 2023, and lane miles swept were lower than average due to the July 2023 flooding and related recovery efforts.

Table 5. Summary of annual acres managed and P load reductions for non-structural BMPs implemented in 2023 (kg/yr)

Lake Segment	SWAT Drainage Area	Paved Roads Acres Swept	Annual P Load Reduction (kg/yr)
1-South Lake B	Mettawee River	13.1	0.051
	Poultney River	45.6	0.22
2-South Lake A	South Lake A - DD	11.2	0.059
3-Port Henry	Port Henry - DD	29.8	0.27
4-Otter Creek	Lewis Creek	37.6	0.31
	Little Otter Creek	121.2	1.09
	Otter Creek	742.5	4.30
5-Main Lake	Winooski River	47.1	0.26
8-Malletts Bay	Lamoille River	251.7	0.98
	Malletts Bay - DD	36.5	0.12
9-Northeast Arm	Northeast Arm - DD	2.6	0.0071
10-St. Albans Bay	St. Albans Bay - DD	42.3	0.16
11-Missisquoi Bay	Missisquoi River	131.4	0.54
	Missisquoi Bay - DD	16.3	0.059
TOTAL		1,528.8	8.43

1.5 Structural Stormwater Treatment Practices

Information about existing and planned structural stormwater treatment practices (STPs) throughout the TS4 is updated in the TS4's BMP Tracking Table and in the implementation model as practices move through design or are constructed. Updates were made to the BMP Tracking Table in the summer of 2024, following its submittal as part of the 2023 TS4 Annual Report, to account for structural STPs completed following the 2023 construction season and adjustments to construction schedules for programmed projects. The BMP Tracking Table adjustments are summarized in Table 6 and credited in the implementation model (Table 7, Figure 1).

Table 6. Summary of impervious and pervious acres managed and P load reductions for structural STPs implemented in 2023

Lake Segment	SWAT Drainage Area	Paved Road Impervious Acres Treated	Developed Pervious Acres Treated	P Load Reduction (kg/yr)
5-Main Lake	Winooski River	7.55	0.00	2.58
TOTAL		7.55	0.00	2.58

VTrans advanced an innovative research project with the University of Vermont, evaluating the potential to enhance P removal in select stormwater treatment practices using drinking water treatment residuals (DWTRs), which are a by-product of drinking water processing[3]. The project began in the fall of 2022 and monitoring continued through the 2023 field season. Results were analyzed and the final report, completed in 2024, is now available. The researchers found that mixing DWTRs into sand media-based stormwater infrastructure can enhance P removal from stormwater. As the first field study of sand filters enhanced with DWTRs in VT, this study clarified anticipated P load reductions for DWTR-amended sand filters and provided guidance for future stormwater treatment practices used in transportation projects.

[3] https://vtrans.vermont.gov/planning/research/projects/22-3

1.6 Natural Resource Restoration Projects

Natural resource restoration projects, and particularly floodplain restoration projects, may be credited as stormwater treatment practices in the context of the VTrans PCP if the floodplain area to be restored is also connected to a TS4 roadway or other VTrans-controlled contributing drainage. Since the Phase 2 PICP submittal, VTrans has continued to complete preliminary evaluations of specific floodplain restoration projects for P reduction credit as opportunities arise.

2. Estimate of extent of completion for remaining items

The draft implementation schedule as presented in the October 1, 2024 PCIP remains generally accurate. Both the schedule and the implementation model are planning-level documents only and will be subject to continued adjustment as the implementation plan is executed. The base assumptions used to populate the model remain unchanged from the Generalized PCP submittal. Updates to those assumptions, particularly assumptions related to implementation costs, will continue as plan execution proceeds.

The implementation model (Table 6) serves as a implementation schedule that includes estimates of the area (acreage) to be treated and the extent and type of treatment strategies that will be applied to meet the P load reduction required from the first PCIP and ultimately from the entire VTrans PCP. While the model is transitioning to a database with enhanced tracking and forecasting capability, estimates of impervious and pervious acres managed or forecast to be treated are available upon request.

Figure 2 provides a visual summary of the implementation model's tracking of P load reductions achieved through calendar 2023 (Table 7), and P load reductions planned and projected through achievement of TMDL target P load reductions before June 17, 2036. At the end of 2023, VTrans achieved 461.67 kg/yr (115%) of the targeted Phase 1 reduction through application of structural and non-structural practices. The P load reduction achieved through 2023 constitutes 29% of VTrans' overall target P load reduction (Figure 2 and Table 6). The implementation model presently indicates that VTrans remains on track to achieve its Phase 1, Phase 2, and Phase 3 target P load reductions roughly a year ahead of the end of those phases and be in compliance with the TMDL target P load reduction in 2035.

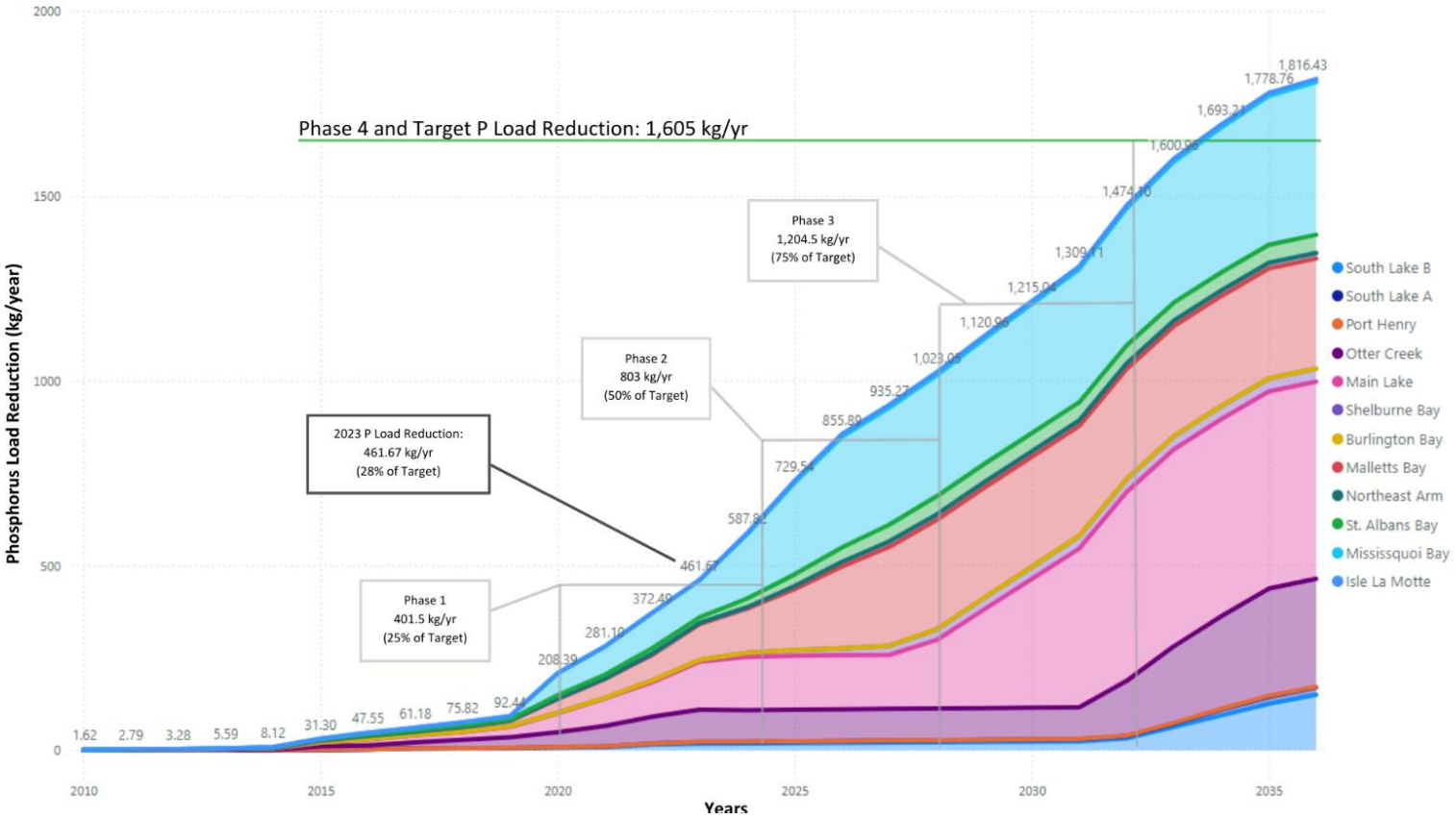


Figure 2. Cumulative annual P load reduction (kg/yr) achieved and projected by Lake segment as of December 31, 2023

3. Assessment of ability to meet remaining schedule items

VTrans is presently on or slightly ahead of schedule and is capable of meeting remaining schedule items. As implementation of the PCPs proceeds, if any changes in ability to meet schedule items arise, VTrans will report on schedule adjustments as warranted.

4. Written designer statements

Subpart 9.2.D.4 of the TS4 General Permit requires submittal of *a written statement signed by a designer acceptable to the Secretary that any structural BMP build or implemented within the preceding 6 month period was constructed in compliance with the approved plans.* No structural BMPs requiring written designer statements were completed explicitly for the VTrans PCP within the preceding 6-month period.

Table 7. Implementation model summary as of December 31, 2023

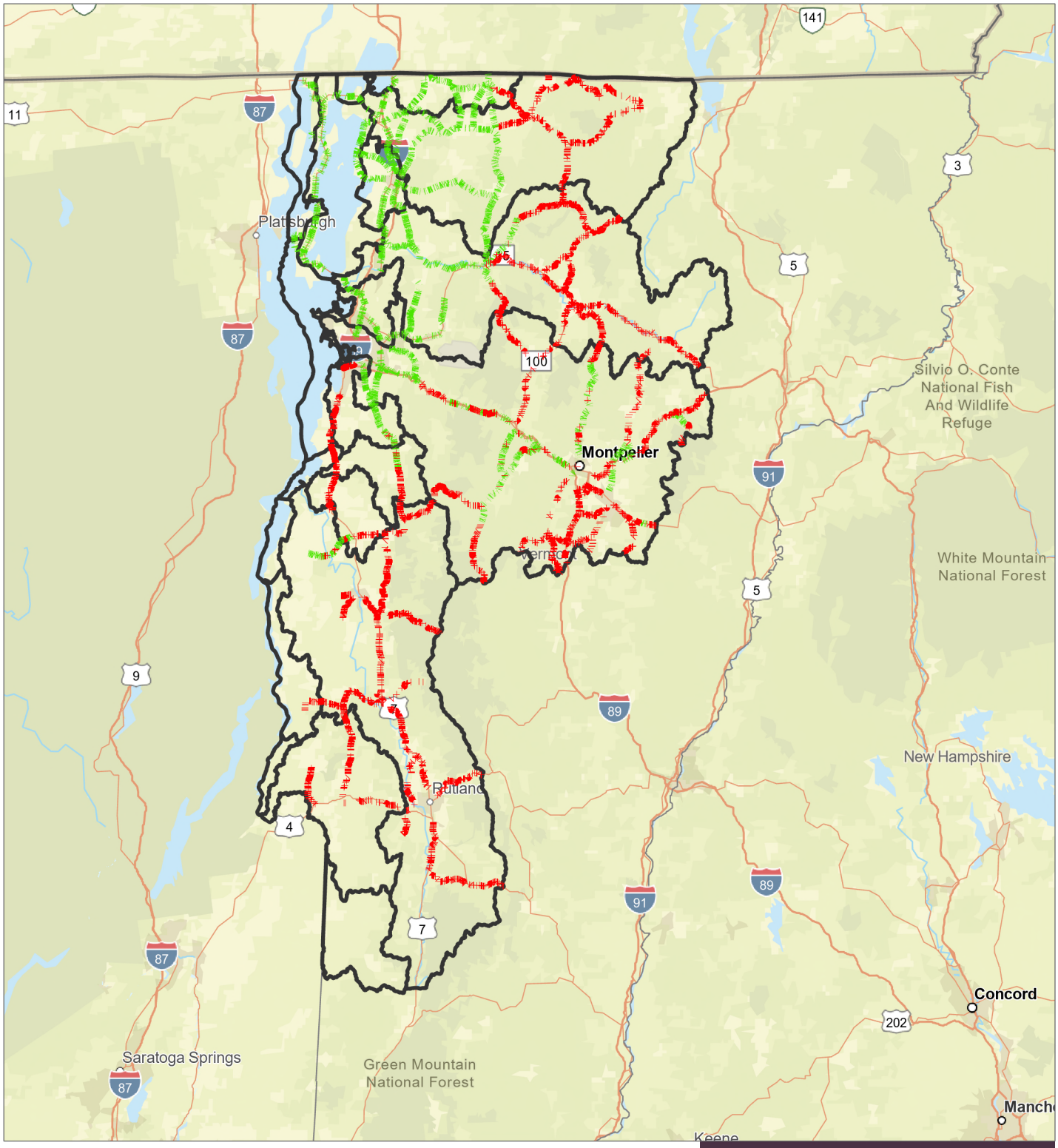
Lake Segment: **Lake Champlain Basin**
Target Reduction: **20.96%**

Land Cover Type	PCP Area (acres)	P Base Load (kg/yr)	P Target Reduction (kg/yr)
Developed Impervious	416.78	466.78	97.85
Paved Roads	5,983.87	4,836.67	1,014.55
Unpaved Roads	12.74	28.85	5.96
Developed Pervious	9,483.84	2,330.74	487.56
Total	15,897.23	7,663.04	1,605.91

Progress to Target P Reduction Key:

- Less than 25%
- 26%-50%
- 51%-75%
- 76%-99%
- 100%+

			Gen PCP, 1st Imp Plan										2nd Imp Plan							3rd Imp Plan				4th Imp Plan			Complete		
Metric	**Lake Segment**	**Total Managed**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**
CUMULATIVE TOTAL P REDUCTION	South Lake B	150.5	0.0	0.0	0.0	0.0	0.0	0.7	2.0	4.4	5.0	5.2	7.3	8.5	15.2	17.6	18.3	19.1	19.9	20.7	21.5	22.3	23.1	23.9	31.7	63.1	94.4	125.8	150.5
CUMULATIVE TOTAL P REDUCTION	South Lake A	19.5	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.7	0.8	1.3	1.2	1.6	2.8	4.3	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	8.6	16.0	19.3	19.5
CUMULATIVE TOTAL P REDUCTION	Port Henry	1.8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.4	0.6	0.6	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	1.4	1.8	1.8	1.8	1.8
CUMULATIVE TOTAL P REDUCTION	Otter Creek	292.6	0.0	0.0	0.4	0.4	0.4	9.6	10.3	16.6	22.6	28.3	39.7	55.0	72.2	87.3	85.1	85.5	85.5	85.6	85.6	85.6	85.6	85.6	148.3	207.7	250.4	290.6	292.6
CUMULATIVE TOTAL P REDUCTION	Main Lake	533.4	1.3	1.4	1.4	1.9	4.4	9.8	16.4	18.4	21.1	28.6	51.3	74.5	93.6	129.6	144.3	145.9	145.9	145.9	185.5	267.4	348.4	429.4	510.7	533.4	533.4	533.4	533.4
CUMULATIVE TOTAL P REDUCTION	Shelburne Bay	35.3	0.0	0.0	0.0	0.0	0.0	0.7	0.6	0.7	0.8	1.7	0.8	1.3	4.7	4.7	10.3	15.4	18.7	24.7	28.5	31.4	32.7	34.0	35.3	35.3	35.3	35.3	35.3
CUMULATIVE TOTAL P REDUCTION	Malletts Bay	297.9	0.4	0.4	0.4	0.4	0.5	4.5	8.8	9.5	12.4	14.1	37.7	51.3	69.1	97.5	120.7	165.0	221.7	267.9	296.5	297.9	297.9	297.9	297.9	297.9	297.9	297.9	297.9
CUMULATIVE TOTAL P REDUCTION	Northeast Arm	14.9	0.0	0.0	0.0	0.0	0.0	0.5	0.7	0.3	0.0	0.9	1.2	1.4	2.7	2.8	3.1	7.8	12.5	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
CUMULATIVE TOTAL P REDUCTION	St. Albans Bay	49.1	0.0	0.5	0.5	2.3	2.3	2.9	4.1	4.2	5.2	4.9	10.4	11.1	15.5	15.5	23.7	31.8	38.7	45.0	49.1	49.1	49.1	49.1	49.1	49.1	49.1	49.1	49.1
CUMULATIVE TOTAL P REDUCTION	Mississquoi Bay	413.6	0.0	0.5	0.5	0.5	0.5	2.0	5.1	7.3	8.2	8.1	59.3	76.6	95.7	101.1	173.8	247.9	299.3	316.8	327.6	338.3	349.1	359.8	370.6	381.3	392.1	402.8	413.6
CUMULATIVE TOTAL P REDUCTION	Isle La Motte	7.9	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.5	0.3	0.2	0.3	0.4	0.5	3.4	5.6	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
CUMULATIVE TOTAL P LOAD REDUCTION	**PCP Area**	**1,816.4**	**1.6**	**2.8**	**3.3**	**5.5**	**8.1**	**31.2**	**48.6**	**62.2**	**76.8**	**93.5**	**209.6**	**282.2**	**372.5**	**461.7**	**587.8**	**729.5**	**855.9**	**935.3**	**1023.0**	**1121.0**	**1215.0**	**1309.1**	**1474.1**	**1601.0**	**1693.2**	**1778.8**	**1816.4**



LEGEND

- Completed Swales 2024
- Completed Swales 2022-2023
- LCB Drainage Areas

N

0 48,000

Feet

2024 Swale Inventory Inspection in the Vermont Lake Champlain Basin

VTrans Lake Champlain PCIP Phase 2

Prepared for Vermont Agency of Transportation

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